INSTITUTO
UNIVERSITÁRIO
DE LISBOA

Serious game about sexual abuse in adolescence

Miguel Santos Nunes Nobre Ferreira

Master in Computer Engineering

Supervisor:
PhD Isabel Alexandre, Assistant Professor
Iscte – Instituto Universitário de Lisboa

Co-Supervisor:
PhD Pedro Faria Lopes, Associate Professor
Iscte – Instituto Universitário de Lisboa

October, 2024

TECHNOLOGY
AND ARCHITECTURE

Department of Information Science and Technology

Serious game about sexual abuse in adolescence

Miguel Santos Nunes Nobre Ferreira

Master in Computer Engineering

Supervisor:
PhD Isabel Alexandre, Assistant Professor
Iscte – Instituto Universitário de Lisboa

Co-Supervisor:
PhD Pedro Faria Lopes, Associate Professor
Iscte – Instituto Universitário de Lisboa

October, 2024

Acknowledgments

This work would not be possible without the constant support from many different people, to all of them I am thankful.

To my supervisors, Professora Isabel Alexandre and Professor Pedro Faria Lopes, I thank them for always being available, for all the time, effort, advice and criticism they offered.

To Professora Joana Alexandre, Professora Rute Agulhas and Iara Gonçalves, I thank them for all the content they created and the opportunity to be a part of this great project with them.

To the 32 users that were a part of the focus group, I thank you for participating, giving us a chance, playing the game with such enthusiasm and giving all their feedback.

To my family, I am thankful for you always believing in me during this part in my life.

To my friends, I am thankful for making me laugh when I was down and helping me relax when I was stressed.

Resumo

Esta dissertação explora a criação de um jogo sério, utilizado em ambiente de sala de aula, desenvolvido para a educação de crianças dos 10 aos 14 anos sobre relações abusivas, prevenção de abusos sexuais, para aprenderem de uma forma acessível e divertida.

Com ajuda das especialistas de psicologia do "Grupo Vita" e reuniões recorrentes, conteúdos e ideias produzidos foram utilizados para construir um artefacto funcional.

Neste trabalho são explorados diferentes temas como "*internet segura*", "*relações saudáveis*", "*emoções, segredos e o corpo*", "*escolhas seguras*" e "*pedir ajuda*". Os desafios consistem em resolver cifras, perguntas de escolha múltipla, arrastar e largar, ligar colunas, sopa de letras.

Foi efectuado um teste funcional com 32 crianças do grupo alvo, que tinha um computador a correr o jogo e uma televisão. As crianças formaram grupos para jogarem o jogo, narravam o que estava a ser mostrado, os outros participavam a partir dos lugares.

Posto isto, os utilizadores preencheram um questionário, uma adaptação do "*System Usability Scale*" (SUS) para crianças, com três simples perguntas adicionais e um espaço para sugestões. Os resultados mostram que os utilizadores consideraram o conteúdo e os desafios eram mais adequados para a parte mais jovem da faixa etária alvo. No entanto, o jogo foi bem recebido, com uma pontuação SUS elevada de 83,2 (~90º percentil), como pontuações elevadas nas outras perguntas, "gostei de jogar", "continuaria a jogar" e "tenciono falar aos amigos". O tema principal das sugestões foi "desenvolver mais níveis e/ou desafios", que demonstra um desejo em continuar a experiência.

Palavras-Chave: jogos sérios; desenvolvimento de jogos; relações e educação sexual; prevenção; abuso sexual infantil; coerção sexual.

Abstract

This dissertation explores the creation of this serious game intended for a classroom environment, built for educating children aged 10 to 14 about abusive relationships and prevention of sexual abuse in an accessible way and playful to learn.

With the help from the psychology experts in "*Grupo Vita*" with consistent meetings, content and ideas produced were used to build a functional artifact.

This work presents an exploration of different themes like "*safe internet*", "*healthy relationships*", "*emotions, secrets and the body*", "*safe choices*" and "*asking for help*". The challenges developed are solving ciphers, multiple choice questions, drag and drops, connecting columns, word search.

There was a functional test made with 32 children in the target range, it included a computer running the game and large display. They formed into groups and played the game, narrating what was showing on the screen, the others participated from their seats.

The users filled in a questionnaire afterwards, an adaptation of the System Usability Scale (SUS) for young children with three simple additional questions and a space for suggestions. The results show that users felt the content and challenges were better suited for the younger part of the target group. However the game was well received, with a high SUS score of 83.2 (~90th percentile) and high scores in the other questions like "*game enjoyment*", "*would continue playing*" and "*will talk to friends*". The main theme of the suggestions was "*develop more levels and/or challenges*" which further shows a strong desire to continue the experience.

Keywords: serious games; game development; relationships and sex education; prevention; child sexual abuse; sexual coercion.

Contents

Acknowledgments iii

Resumo v

Abstract vii

Glossary xi

Chapter 1. Introduction 1

1.1. Motivation 1

1.2. Research Questions 1

1.3. Goals 1

1.4. Methodology 2

Chapter 2. State of the Art 5

2.1. Systematic Review 5

2.2. Related Work 6

2.2.1. Conclusion 16

Chapter 3. Development 17

3.1. Origin of Project 17

3.2. Project Engine 17

3.3. Initial Concept 17

3.4. Game 18

3.4.1. Chapter 1 - Lighthouse 21

3.4.2. Chapter 2 - Cliff 28

3.4.3. Chapter 3 - Beach 32

3.4.4 Chapter 4 - Chapel 38

3.4.5 Chapter 5 - Bonfire 41

Chapter 4. Evaluation 47

4.1. Focus groups 47

4.2. Questionnaire 48

4.3. Results 49

4.4. Suggestions 52

4.5. Notes 53

Chapter 5. Conclusions and future work 57
3.1. Future work 57
3.5. Conclusion 57

References 59

Glossary

RPG - Role-Playing Game

NPC - Non-Player Character

DSRM - Design Science Research Methodology

VR – Virtual Reality

CHAPTER 1

Introduction

This chapter describes the theme, the motivation for the dissertation as well as its goals. The motivation will be described in detail as well as the initial idea and also why it is important and for whom it is directed at. Following the research questions are presented followed by the goals, where it is outlined what are the intentions for the final product, finally the methodology used for this dissertation is briefly explained.

1.1. Motivation

Sexual abuse is a very sensitive topic, a lot of effort is put into helping children by teaching them the differences between acceptable and unacceptable events. A lot of these efforts to teach them are through some type of playing, either board or computer games because as a medium, games are more interactive than reading or listening to a person talk about an occurrence. Therefore, it allows for better memory of those learnt experiences and it facilitates the discussion of those topics which still are a taboo nowadays. There is unfortunately still a lack of many of those same games and activities specifically aimed at young teens which is why this dissertation will have as target audience children of ages 10 to 14.

1.2. Research Questions

(1) Is a serious game an effective approach to teach teenagers about the prevention of sexual abuse?

(2) Is this game fun and engaging enough to keep teenagers motivated to continue playing?

(3) Is the target audience of ages 10 to 14 accurate? If not, what would be the best age group?

1.3. Goals

The main goal of this dissertation is to develop a computer game that can function as a platform to teach important information in a safe environment, to prevent or possibly help stop certain risk situations, namely sexual abuse or abusive relationships.

This artifact will be a singleplayer role-playing game (RPG) where players will play the role of teenager, with several different chapters where players will be able to interact with the world around them, experience difficult scenarios and make decisions according to the information

available to them.

The ultimate goal is that teenagers will be able to understand the importance of this topic, learn about it and do well informed decisions throughout their lives.

1.4. Methodology

The used methodology was the "Design Science Research Methodology" (DSRM). This model includes six steps: "identify problem and motivate", "define objectives of a solution", "design and development", "demonstration", "evaluation", and "communication", it also has four initiation possibilities which are: "problem-centered initiation", "objective-centered solution", "design and development-centered initiation", and "client/context initiation".

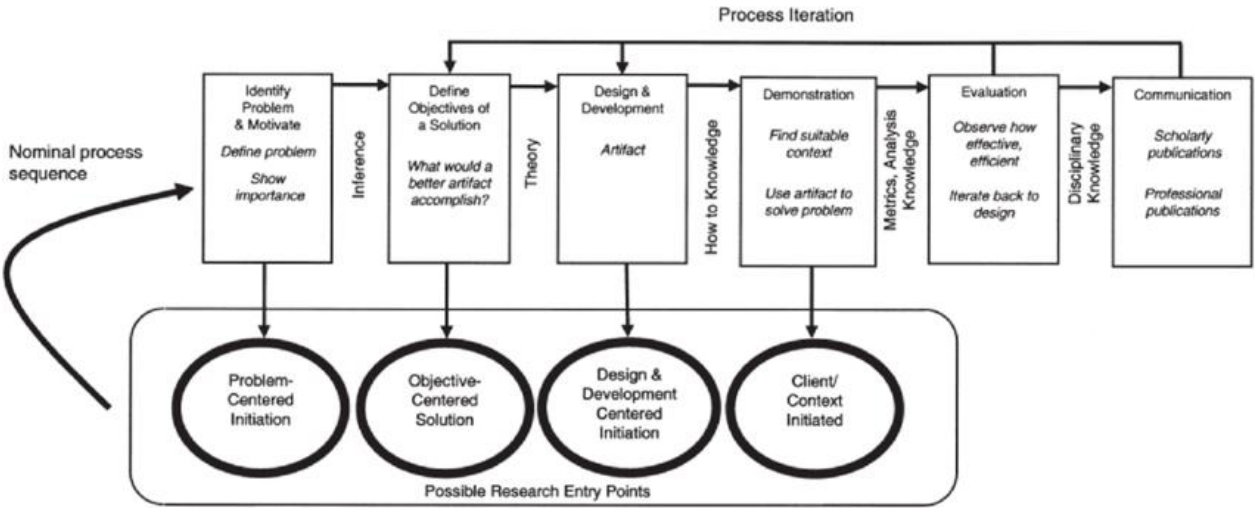


Figure 1: DSR Methodology Process Model from (Peffers et al., 2007-8)

According to *"Introduction to Design Science Research"* [1] these six steps can be described as such:

*"**Activity 1.** Problem identification and motivation. This activity defines the specific research problem and justifies the value of a solution. Justifying the value of a solution accomplishes two things: it motivates the researcher and the audience of the research to pursue the solution and it helps the audience to appreciate the researcher's understanding of the problem. Resources required for this activity include knowledge of the state of the problem and the importance of its solution."*

*"**Activity 2.** Define the objectives for a solution. The objectives of a solution can be inferred from the problem definition and knowledge of what is possible and feasible. The objectives can be quantitative, e.g., terms in which a desirable solution would be better than current ones, or qualitative, e.g., a description of how a new artifact is expected to support solutions to problems not hitherto addressed. The objectives should be inferred rationally from the problem specification."*

*"**Activity 3.** Design and development. An artifact is created. Conceptually, a DSR artifact can be any designed object in which a research contribution is embedded in the design. This activity includes*

determining the artifact's desired functionality and its architecture and then creating the actual artifact."

*"**Activity 4**. Demonstration. This activity demonstrates the use of the artifact to solve one or more instances of the problem. This could involve its use in experimentation, simulation, case study, proof, or other appropriate activity."*

*"**Activity 5**. Evaluation. The evaluation measures how well the artifact supports a solution to the problem. This activity involves comparing the objectives of a solution to actual observed results from use of the artifact in context. Depending on the nature of the problem venue and the artifact, evaluation could take many forms. At the end of this activity the researchers can decide whether to iterate back to step three to try to improve the effectiveness of the artifact or to continue on to communication and leave further improvement to subsequent projects."*

*"**Activity 6**. Communication. Here all aspects of the problem and the designed artifact are communicated to the relevant stakeholders. Appropriate forms of communication are employed depending upon the research goals and the audience, such as practicing professionals."*

With the help of these definitions, this thesis can better focus on each point as it was highlighted.

Out of the four possible initiation options, this project will choose *"Design and Development Centered Initiation"* as its starting point, due to the fact that the problem has already been defined by professionals in the branch of psychology and its importance laboriously studied prior to this project's existence and in fact the main goal of thesis is the creation of a serious video game to mostly adapt content from other contexts, rather than invent new solutions. As such, the "*Design and development*" activity took the majority of the time, of course followed by *"Demonstration"* and *"Evaluation"* in several meetings to allow the iterative process to smooth out any problems and result in the best possible artifact.

CHAPTER 2

State of the Art

This chapter presents a literature review using a systematic approach. It describes the databases, search queries, and filters used to find the relevant articles, along with explanations of key aspects of the related works.

2.1. Systematic Review

The databases used were SCOPUS, ScienceDirect, IEEE, ACM Digital Library, Wiley Online Library and JSTOR.

The topic searched was a serious game about sexual abuse in teenagers, but there were very few articles for this specific issue. For this dissertation it was decided that the only type of "abuse" that would be considered was "sexual abuse", the only type of media would be a "serious game", as articles referencing game were usually based around video game addictions or abuse caused in games rather than games made with the intention to help and there were also a lot of other mediums besides video games which were deemed too different for this project.

The initial query used was:

"sexual abuse" AND "serious game" AND ("adolescent" OR "teen" OR "teenager")

However, due to the low number of articles another query was created which was:

"sexual abuse" AND "serious game"

The second query was handled with less importance compared to the first one because it didn't focus on the intended audience. In fact, most of the articles from this query were aimed at children. The findings were viewed as a minor addition, only considered because the original query produced few results.

It was required to filter and only keep articles, remove all the duplicates, articles that were not in English or Portuguese, articles that were behind a paywall, as well as articles that appeared with the query but were deemed not correctly representing this thesis' objective, such as games specifically designed for people with intellectual disabilities (*ex."ITaCaS: a serious game and an expert system to support the teaching of sexual-health and hygiene for youth with intellectual disability")* or other such articles.

Table 1: Databases and their results to the corresponding queries before and after filtering, filtered number in column already accounting removed duplicate works found in previous columns.

Database	Query 1	Filtered 1	Query 2	Filtered 2
SCOPUS	3	3	10	5
ScienceDirect	8	4	14	1
IEEE	1	0	3	0
ACM Digital Library	9	0	15	1
Wiley Online Library	16	0	20	0
JSTOR	2	0	13	0
Total	39	7	75	7

2.2. Related Work

In [2] and as seen in figure 2, there are four main types of abuse *"1) emotional or psychological abuse, 2) child neglect, 3) physical abuse, and 4) sexual abuse"*, this dissertation however will only focus this last one. Below is a figure taken from the same source [2], where they categorize all the literature they found for digital games and virtual reality (VR) games.

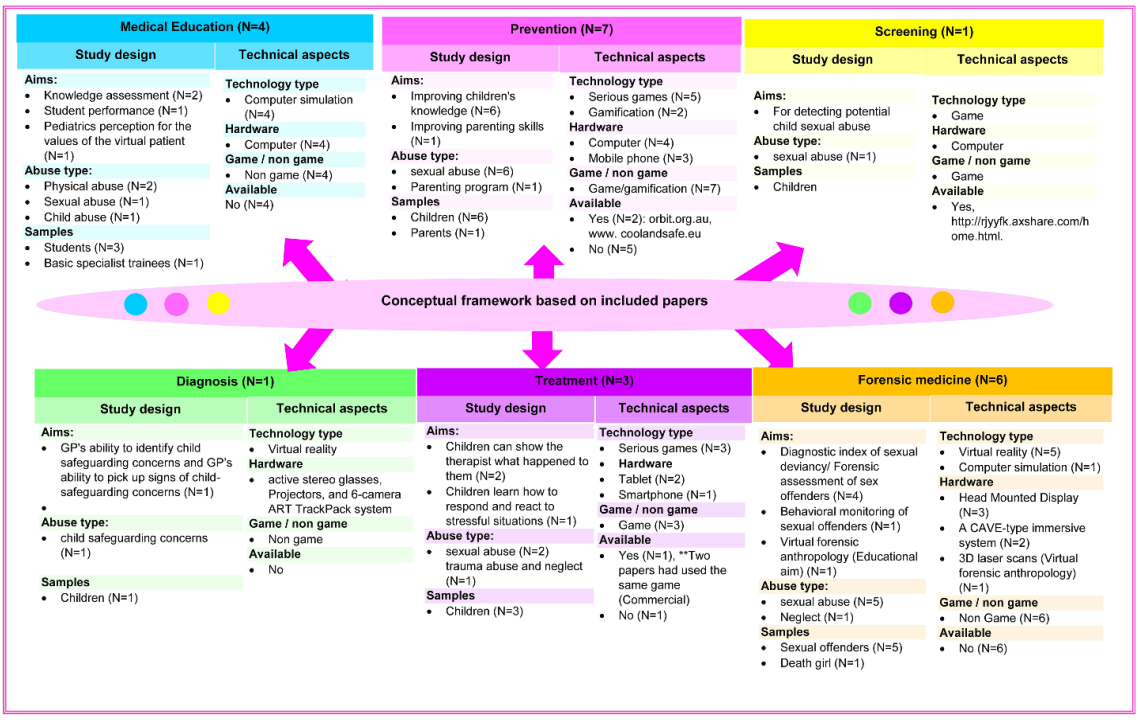


Figure 2. Overview of the digital games and VR for child abuse issues according to literature; N = Number of studies. [2]

Taking into account that this dissertation's purpose is the development of a functional artifact which is a "*serious game*" with the theme of "*sexual abuse*", it is visible in this data that the categories "*Prevention*", "*Screening*" and "*Treatment*" are the most common for serious games.

The goal of this project is to fit mainly in the "*prevention*" category. However, this article refers to "*children*" as any person under eighteen years old, without anything specifically for teenagers therefore the data needs to be accepted as such and some adaptation is necessary for

the best results.

In this figure 3 also taken from [2], it is visible the focus on the side of the prevention of child sexual abuse using "*serious games*".

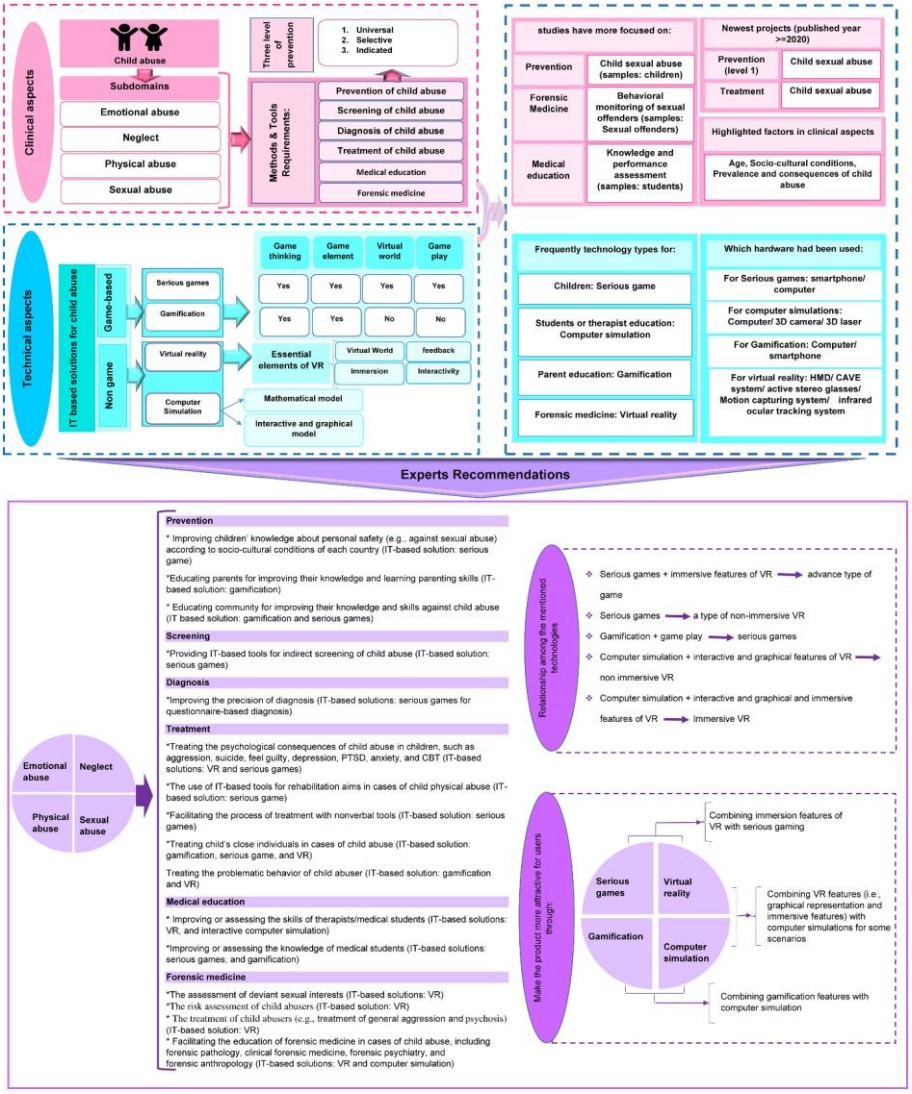


Figure 3. Conceptual framework for digital games and VR potentials in child abuse; IT: Information technology, VR: Virtual reality, PTSD: Post-traumatic stress disorder, CBT: Cognitive behavioral therapy. [2]

This was followed by the experts' recommendations for the main objectives, for "*prevention"* the goals were: "*improving children's knowledge about personal safety*", "*educating parents for improving their knowledge and learning parenting skills*" and "*educating community for improving their knowledge and skills against child abuse*". All three of these points directly referencing the usage of "*serious games*" and "*gamification*" as an ideal solution.

The sources [3] and [4] are an article and a review respectively of the serious game which is "*Vil Du?!"*.

In terms of the previously seen categories, it would fall on the "*treatment*" seeing as it is a serious game where you play with your therapist to facilitate narrating the events that

happened [3].

It is considered helpful for reducing the barrier to talking about sexual abuse experiences by creating distance between the client, the therapist and the experience. "*Regarding the physical distance, a therapist reported as follows:*

It is not face-to-face, it is not direct, you talk in a triangle. You talk about something [the tablet] that is on the table and about that what has happened, which creates distance." [4]

Besides being used for "*treatment*" it could be used for "*prevention*", which is teaching the children/teens about what types of boundaries they have, however since it was not the main focus of this app, the sample size is quite small.

"As described by one therapist: I think the Vil Du?! app can help. (...) if it is about indicating boundaries. (...) another therapist was cautious about using the game to teach self-protection skills with specific victims. (...) teaching self-protection skills might increase feelings of guilt." [3]

As is visible in table 2, only 13% of the clients answered in the questionnaire that it was teaching self-protection skills, however eight therapists expressed that it was useful for "*recognizing and indication boundaries*" and three "*recognizing intuitive feelings of danger*" meaning that a tool like this app can have very real usability if built from scratch for the purpose of "*prevention*" and "*teaching self-protection*".

The authors of [3] even state that there is a need or a serious potential to transform this app for usage in prevention or detection of sexual abuse.

Table 2 Questionnaire and interview data about the CBT components in which therapists used Vil Du?! [3]

CBT components in which Vil Du?! was used	Questionnaires % clients	Interviews Therapists (*n*)
Narration and processing of the CSA experience(s)		
Q: Let client tell about CSA experiences	61	
Q: Discover details about CSA experience	57	
Q: Process CSA experiences in a safe environment	30	
Q: Relive CSA experiences in a safe environment	13	
I: With clients		10
I: With clients' parents		4
Psycho-education about sexuality		
Q: Education about personal space and boundaries	30	
Q: Education about CSA and sexuality	26	
I: Learning sexuality related vocabulary		6
I: Learning about (in)appropriate sexual behavior		6
Teaching self-protection skills	13	
I: Recognizing and indicating boundaries		8
I: Recognizing intuitive feelings of danger		3

Q and I under CBT components represent specific categories or codes that were asked in the questionnaire (Q) or identified in the interviews (I). Questionnaire data represents frequencies computed in SPSS

"*Next steps in the broader implementation of Vil Du?! could be to explore the useability of the game for prevention purposes (e.g., psycho-education about sexuality and appropriate and inappropriate touching in schools) and early detection of sexual abuse (e.g., use during consultations with children in child welfare clinics)." [3].*

In [5], the target audience is the same as this project, however it focused on a different problem "dating violence", rather than "sexual abuse". This article goes through the development of a serious game called "*Green Acres High*". "*It was seen that using a serious game was a valid and meaningful way for adolescents to learn about dating violence and that this is a viable alternative or adjunct to traditional teaching methods*" [5]

As seen in table 3, the game is comprised of five individual lessons, each with their own objective to teach different aspects of dating violence.

Table 3. Overview of lesson aims, learning outcomes and behavior/attitude change techniques [5]

Lesson	Aims	Learning outcomes: At the end of the lesson students will...	Techniques	Theory
1	• To determine young people's relationship values • To identify characteristics of healthy relationships • To identify characteristic of unhealthy relationships	• Have a clear understanding of the characteristics of positive and negative relationships • Be able to identify some of the warning signs of potentially abusive relationships. • Have obtained knowledge about the nature of abuse	• Provide information • Provide feedback • Provide contingent rewards	IMB CT OC
2	• To identify warning signs of abuse • To identify the dynamics of abusive relationships	• Be able to correctly identify different forms of abusive behaviour • Be able to identify warning signs of abuse in relationships • Be able to describe the cycle of abuse	• Provide information • Provide feedback • Provide contingent rewards • Provide general encouragement	IMB CT OC SCogT
3	• To educate young people about the role of stereotypes in abuse • To identify risk factors for getting involved in abusive relationships	• Be able to identify risk factors for abuse • Be able to describe how gender stereotypical attitudes can facilitate abusive behaviours	• Provide information • Provide feedback • Provide contingent rewards • Provide general encouragement	IMB CT OC SCogT
4	• To educate young people about the different steps within conflict resolution • To enable young people to practice conflict resolution skills	• Be able to identify the individual steps within the process of conflict resolution	• Provide information • Provide instruction • Provide feedback • Provide contingent rewards • Prompt practice • Provide general encouragement • Provide information on consequences	IMB SCogT CT OC OC SCogT IMB;SCogT
5	• To educate young people about how best to seek help whilst maintaining their own safety • To raise awareness about local services that can offer support to young people in abusive relationships	• Be able to identify sources of help within their schools and communities • Be able to consider appropriate courses of action should a friend be involved in an abusive relationship • Be able to consider appropriate courses of action should they themselves be involved in an abusive relationship	• Provide information • Provide instruction • Provide feedback • Provide contingent rewards • Provide general encouragement	IMB SCogT CT OC SCogT

Note. IMB = information-motivation-behavioural skills model, SCogT = Social-cognitive theory, OC = Operant conditioning, CT = Control theory.

The main experience consisted of "*Experiential learning*" or learning by doing which means that by letting adolescents interact with and experience some problems and decisions regarding dating violence in a safe environment is potentially an ideal way to learn how to deal and avoid these problems in real life scenarios "*adolescents acknowledge that learning has actually been achieved and therefore playing the game is positive and worthwhile experience*" [5] and "*The adolescents identified that key to the process of learning through 'doing' was the fact that the experiences were interactive*.".

Some of the quotes from the adolescents that played the game resonate this feeling of how important "learning by doing" is to facilitate how well the lessons are taught as well as lowering the barrier to entry because of the fact that the person is alone with a computer rather than speaking to another person and due to the immersive nature of video games the people can experience these games deeply without any real risk to their own lives and/or safety.

"*1A: I think people are more likely to listen more instead of just a teacher telling you stuff; people will actually interact with the game because it's just you and a computer."*

"*3B: Erm, I think it was good that they included real scenarios that could happen and it made you deal with them.*

"*2A: Made me understand it, there was lots of different scenarios, lots of options and things you could choose from and then about the abuse you saw, the different things to look at it clearly showed you what to look out for.*

2D: Gave you a sense that if you did something good then it would tell you if you did it good, but if you did something bad it would tell you why it was bad not just oh you did it wrong... it was just helpful and it told us how we could do better." [5]

In [6] the article is about the development of a "serious game" surrounding "sexual education" and "sexual coercion".

In their approach to the development of the game, "Intervention Mapping" was used, it is an approach used to "guide the development of health promotion interventions/programmes", with the following steps.

"IM1 – needs assessment;

IM2 – developing programme objectives (and related performance and change objectives);

IM3 – developing theory-based methods and practical strategies to meet those objectives;

IM4 – developing a programme plan;

IM5 – programme implementation (the complete RSE intervention programme including the teachers manual and implementation of the game-based learning content); and

IM6 – programme evaluation" [6]

This game is based on the concept of a Game Show where you can play as a group. The game flow is distributed into two parts the "Questions and Answers" and the "Role Play". The first part involves group discourse where the game show host narrates six scenarios on potential coercive behavior and the objective is to get the group discussing and reaching a response. The second part is a "Role Playing" round, where there will be two scenarios in which the players have a choice to be the "coerced" or the "coercer", the objective is for the group of players to be able to make the correct choice at each key point in those scenarios.

At any time, it is possible for someone to "pause" the game to allow for more time to think and discuss the situation.

This following information is related to table 4, which is a detailed explanation of this project's targets, learning mechanics, game mechanics and their implementation.

"O1: Discovery, analysis and identification – The ability to identifying the nature and levels

of coercion is a key target of PR:EPARe, which are supported by the different scenarios on coercive behavior.

O2: Competition and feedback – As part of the game mechanic, competition and feedback promotes real-time and positive interaction and engagement within game play.

O3: Active participation and reflection – exploratory learning is promoted by encouraging communal discourse, reflection and debriefing during and after game-play. Cooperation and teamwork are promoted by blending technology into the traditional classroom setting." [6]

Table 4. Learning and Game Mechanics for PR:EPARe

Targets	Learning mechanics	Game mechanics	Implementation
O1: Discovery analysis and Identification	• Identification • Generalisation/ Discrimination • Discover • Analyse • Repetition	• Selecting • Questions and answers • Information • Story • Response	**Part 1:** Question and Answer • The host characters narrate the scenarios (1–6). The mechanics involve 'point and clicking' on the NPCs representing a YES, NO and an MAYBE. • A pause button allows the teacher to pause the game to allow time for communal discussions. This promotes teamwork and exploratory learning. The group of pupils will learn how to analyse the scenarios, identify and recognise coercive behaviours and consider how to respond from a range of perspectives.
	• Observation • Guidance • Participation • Reflect/discuss • Explore	• Role play • Simulate • Response • Communal discovery • Cooperation	**Part 2:** Roleplay • Each scenario (1–2) starts with a first person roleplay that ends up with a negative consequence. The player is allowed to point and click on the dialogue boxes. This encourages players to identify negative behaviours and experience negative consequences but from a safe position. • The player can then repeat the scenario and is given the opportunity to give an alternative response to avoid being coerced or acting coercively towards someone else. A text-box allows the teacher and the pupils to decide on a response as a team, establishing peer support for the alternative response. • Roles include the coerced and the coercer. • A pause button can be used to stop at any time during the role-play to allow communal discourse.
O2: Competition and feedbacks	• Feedback • Incentive	• Competition • Time pressure • Rewards/penalties • Feedback Action points	**Part 1:** After response to the scenarios are given, feedback and information summary (action points) are provided: • A timer is used to instil a sense of urgency for a response to be provided. • Each correct answer will give the player 300 points and the incorrect ones will cost the player 100 points. Scoring system is to promote active participation and competitiveness (e.g. between classrooms). • Feedback for wrong and correct answers using appropriate sound effect and visual • Explanation on appropriate responses is delivered by the host characters (NPCs) • The key feedback points are listed on the screen as guidance • Scores are rewarded or deducted. **Part 2:** After going through the 2-part scenarios: • Feedback for negative and positive consequences are given using an art visual • Explanation on the scenarios is delivered by the host characters (NPCs).
	• Participation • Competition	• Role play • Realism • Competition • Time pressure	Positive participation is encouraged via mechanics that promotes competition, such as scoring and time pressure. The competition is however between classrooms within the same school. The communal discourse and debriefing made possible by the pause button add another dimension to realism of the topic. The scenarios are very direct and based on potential coercive experiences.
O3: Active participation and reflections	• Feedback • Guidance	• Feedback • Information • Action Points	After responses to the scenarios are given, feedbacks and information summary are provided: • Feedback for wrong and correct answers using appropriate sound effect and visual • Explanation on appropriate responses is delivered by the host character (NPC) • The key feedback points are listed on the screen as guidance
	• Reflection/ discussion • Participation • Explore Discover	• Cooperation • Communal Discovery • Information • Action points	Communal discourse on each scenarios are supported by: • A pause button within each scenario (both Part 1 and 2) • The key feedback points listed on the screen assist discussions and reflection (during game-play when it is paused and as part of a debriefing activity)

"In particular, teachers consistently reported that the topic of the Serious Game, with its focus on sexual coercion and pressure in relationships, was particularly useful from their perspective. Several teachers reported that students had identified this as a topic they wanted more focus on in RSE (…)" [6]

This article demonstrates and explains that there is a real necessity for the development of

more “serious games” surrounding these topics of “sexual abuse” or “sexual coercion” specifically targeted at adolescents because they can be at risk and therefore it can have very serious importance in their lives to be exposed to these games and learn such lessons. “The game was overwhelmingly given positive feedback by all classes except one. The single class who gave less positive feedback felt that it would be better targeted at the school year below them.” [6]

In [7] the authors propose to adapt the teaching of preventive measures for child sexual abuse to an E-learning context.

Positives of switching to an e-learning context, in table 6, include an increase in flexibility of when students are able to access the content, not being limited to presence in a classroom, can reach more people regardless of where you are geographically, the parents/teachers can customize what types of content, learning formats and timing are best suited for the needs of the child for better knowledge retention. “*...children need to learn by doing. When designing an e-learning program, creators should be sure to harness a wide range of persuasive role models in the form of characters and/or animations who can demonstrate effective skills and engage children in cycles of practice and feedback.*” and “*...students in anonymous discussions in e-learning settings tend to collaborate proportionately whereas in-person there tends to be more activity from one or two students than all others in the group.”* [7]

Negatives points are that the content is limited by the students’ internet access and equipment, might be more difficult for children to engage in the content having no incentive to interact with like they do in a classroom and puts more pressure/responsibility on the parents to engage with their children for them to learn. “*e-learning has placed more responsibility on parents to engage with their child which will, in turn, contribute to their child's successes as an e-learning student*” [7]

Unfortunately, there are still a lot of doubts around e-learning and how to best control the engagement with e-learning content, especially when it comes to a topic as sensitive as sexual abuse as well as when it comes to children or adolescents which may not understand how important this type of content awareness can be. “*The limited literature on CSA prevention programs delivered virtually leaves us unsure as to whether implementing these programs will result in better or worse outcomes for children. Because of the mixed literature, we conclude that, when possible, virtual instruction for prevention education should supplement, not replace, in person instruction*” [7]

Table 6. Factors to consider in the implementation of e-learning.

	Classroom-based learning	*E*-learning
Access	• Limited to students present in classroom • No requirements of internet or related equipment	• No limit of geography • Can access more children • Content must be tailored for different audiences, prevailing laws and policies, and cultural acceptability of CSA prevention materials and resources • Limited by students' access to internet and related equipment
Time	• Some prevention programs are presented in single sessions but many use multiple sessions over several weeks	• Offers flexibility in the packaging of content to fit time available • May extend the amount of time students spend with the material. • Asynchronous learning may make it more difficult for children to engage or stay engaged
Interactive activities/ skills-based learning	• Best practices include role-playing, modeling, practice via active participation, problem solving, and rehearsal, use of videos and small group discussions	• Best practices for learning by doing becomes more difficult • Anonymous group discussions in e-learning settings tend to be more egalitarian
Disclosures	• Expectation is that discussing CSA and offering a resource for reporting will encourage or facilitate disclosures	• *E*-learning that includes an adult monitor or teacher could offer the same opportunities for and likelihood of disclosing CSA
Monitoring students for distress	• Instructors can visually observe students' behaviors	• Instructors may not be able to observe students' behaviors
Developmental differences	• Can be tailored for a group (e.g., classroom), but not individual	• Allows children, parents, and/or teachers to customize learning formats and timing of the lessons to best suit the developmental needs of the child/age group and enhance interest, engagement, and knowledge retention.
Parent participation	• Parent involvement is preferred but difficult to foster	• *E*-learning puts more onus on parents to engage with children in their learning • Learning about CSA at home may stimulate difficult but necessary discussions with parents OR it may also be viewed as an invasion of privacy

In [8] he authors present the usage of serious games and gamification to protect and arm vulnerable groups with important knowledge, detailing different target groups, types of risk and empowerment methods, figure 4.

For the purposes of this dissertation, the most important categories to consider in "target group" would be "age" since the main focus to this artifact is the target audience being adolescents. In "type of risk" the concept of sexual abuse could fit legitimately into any of the three "health", "safety" or "social".

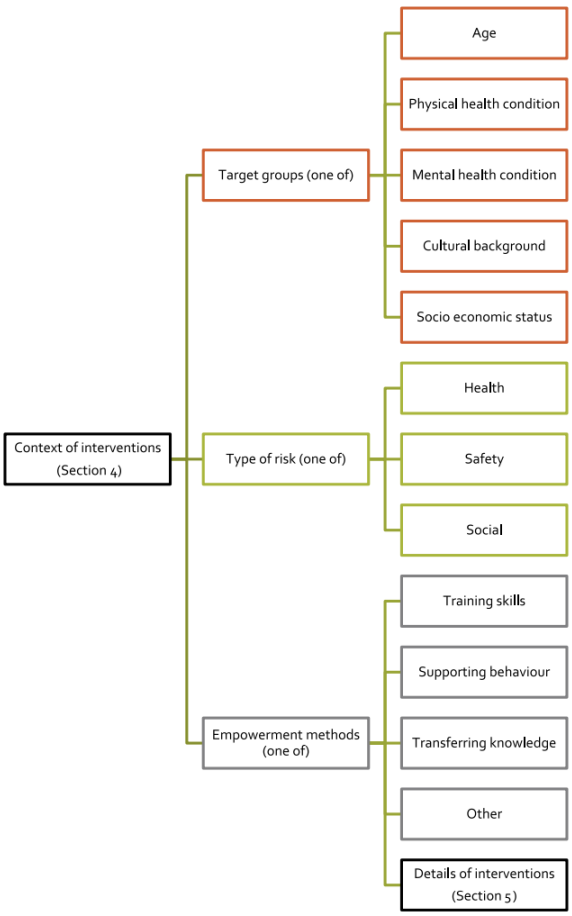


Figure 4. Overview concepts of taxonomy [8]

In the figures 5, 6 and 7, are the most popular game mechanics for the empowerment methods of figure 4:

- "Objectives" encourage players to get better by using features like timers or scoreboards, and progress bars can help promote repeated actions.
- "Rewards" give players feedback on their performance using badges, trophies, achievements or points/coins which can then be used inside the game to gaining something, creating a desire to keep playing to get other rewards.
- "Story, scenario, and avatars" use a story to find out what happened or what can happen to the character(s), highlighting the choices they make which results in positive or negative outcomes for the character(s).
- "*Player data insights*" registering data from the player such as physical activity and eating behaviors or giving advice for the game which is adapted to the player.
- "*Social*" used to give a sense of competition through the use of leaderboards to measure the relative performance to other players.
- "*Notification*" sending regular messages to inform players about their performance.

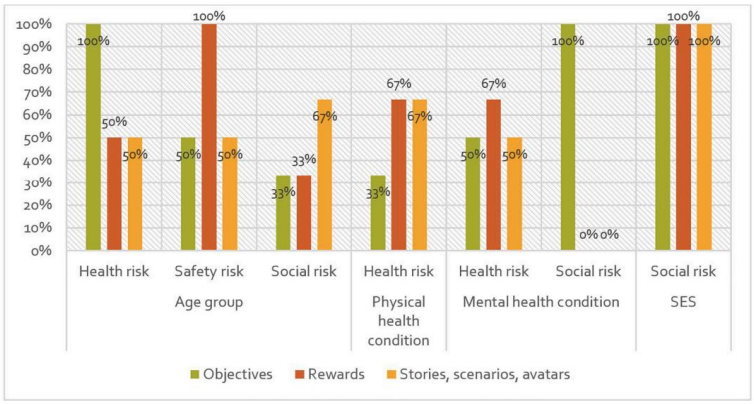


Figure 5. Popular game mechanics used for training skills for different target groups. [8]



Figure 6. Popular game mechanics for transferring knowledge used for different target groups. [8]

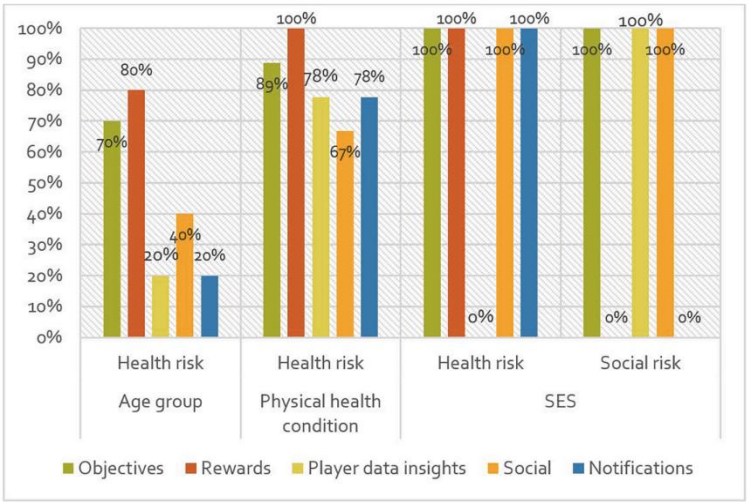


Figure 7. Popular game mechanics for supporting behavior used for different target groups. [8]

For “age group”, the most used game mechanics were the “objectives” and “rewards”, “Story, scenario, and avatars” was also very used, meaning that players are more likely to respond positively to the game and want to keep playing it if it contains some objectives, rewards and stories.

2.2.1. Conclusion

These articles explain the need for more serious games for the prevention of sexual abuse being made for teens, how important it is for them to learn these lessons and how to motivate them:

[2] teaches that prevention is the best approach and how well it works with digital games and gamification.

[3] and [4] explain that there is a strong need for a new tool built from scratch that focuses on prevention and teaching self-protection skills.

[5] shows how important it is for teenagers to experience "learning by doing" in a safe environment.

[6] teaches that role-playing allows teenagers to step into different situations, helping them gain valuable perspective.

[7] explains the difficulties of teaching these subjects online. There are some advantages, however teaching in person is better.

[8] shows that the most effective ways for games to motivate the player's action is by using objectives, rewards and stories that are designed for their age.

CHAPTER 3

Development

This chapter describes the process of development of the project, which includes its origin, the chosen engine, the initial concept, the minigames, planning, decisions and changes made up to the final product.

3.1. Origin of Project

The development of this project originated in a meeting with professors *Joana Alexandre* and *Rute Agulhas* from "*Grupo Vita*", meeting that was setup by this project's supervisors *Isabel Machado Alexandre* and *Pedro Faria Lopes*.

In this meeting it was expressed an interest in developing a serious game for prevention or awareness of sexual abuse in teenagers, more specifically young people aged between 10 and 14 years old and why it was necessary to develop this project digitally.

It was also discussed their previous experiences, involved in the creation of *"Picos e Avelã*", a board game that approaches the same topics for much younger children (ages between 3 and 6), how it works and why it's important.

3.2. Project Engine

The engine chosen for the development of this project was Unity. It was chosen based on the objectives and requirements previously discussed during the origin of the project and other subsequent meetings as well as previous experience using this engine in other courses namely *"Programação e Geração de Mundos Virtuais*" and *"Design e Produção de Jogos Digitais*" of *Mestrado em Engenharia Informática* in *ISCTE.*

3.3. Initial Concept

As a test and to showcase the capabilities of the engine, the initial scene developed was the exploration of a house using images from *VectorStock.com*.

In this house, in figure 8, you could move between the different rooms to find objects to pick up and an NPC which was interactable as well.

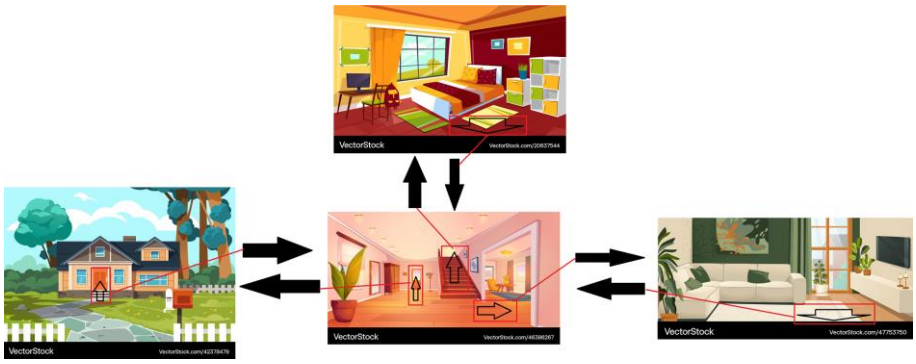


Figure 8. Initial implementation of the concept for exploration and interaction (Chapter 0)

The main concept was to be able to explore different locations, have minigames that could be played and dialogue with NPCs. However, due to the nature of the project there was a greater need to pass the information that was most important and therefore have more development time focused on the minigame aspect. The time constraint was only a factor which resulted in the exploration being limited to exploring the different chapters of the game rather than each chapter having its own multiple screens as initially intended.

The final theme which was reached was for the entirety of the game to be a youth journey along the course of one day, where we would use the symbolism of a lighthouse as a metaphor for "guiding the way".

The game starts with a lighthouse at dawn and across the day they would pass through a cliff to a beach, then a boat ride to an island with a chapel where the daylight was ending and thus a bonfire was lit and with the concept of people around a fire is where the game would end.

The development of the game followed a Low-Fidelity approach as learned in the Curricular Unit *"Design e Produção de Jogos Digitais"*: all images and backgrounds were lent from web searching so that the game content, programming and debugging could be created in a timely manner. From the beginning of the project, it was known that an illustrator and a designer would be hired once the game was programmed and debugged. This approach enables lowering the development costs and at the same time to obtain a functionally playable game.

There were also many regularly scheduled meetings throughout the entire project with all the professors to discuss the types of content, challenges, layouts that would be best for the development.

3.4. Game

The project opens to a simple start screen with title and buttons "*Novo Jogo*", "*Continua*r" or "*Sair*". It proceeds to the roadmap when the "*start game*" button is pressed.

After an introductory dialogue, the player is introduced to the 5 chapters and is able to choose which chapter to access based on their descriptions: "*Internet segura*", "*Relações saudáveis e comunicação assertiva*", "*Emoções, segredos e corpo*", "*Escolhas seguras contra as estratégias da pessoa agressora*", "*Comportamento de ajuda e pedir ajuda*".

In the beginning of each chapter there is a short dialogue to set the scene to the players. Following that there is a series of minigames which need to be completed in order to finish the chapter and return to the map. Visible in figure 9 is the general game flow.



Figure 9. Final project implemented game flow

When first open the game figure 10 is the first screen that appears, being able to start the game or exit the application with a disabled button for continuing.



Figure 10. First screen of application.

After the player clicks the "*new game*" button, we game progresses to a screen with the map and an initial dialogue by the teacher character called "*Prof. Fernando*", in figure 11.

The teacher basically explains who he is and the objective of the game, which is to pass through multiple locations displayed on the map and completing challenges, these challenges or minigames were designed for children to learn how to protect themselves and/or identify risk situations while teaching them safe practices and what should be done in certain situations for the varied topics of each chapter.

Following this introduction, the roadmap is promptly displayed in figure 12 and the player is free to choose whichever chapter they want to tackle based on their description, however for the purposes of following the storyline it would be recommended to complete the chapters from left to right.

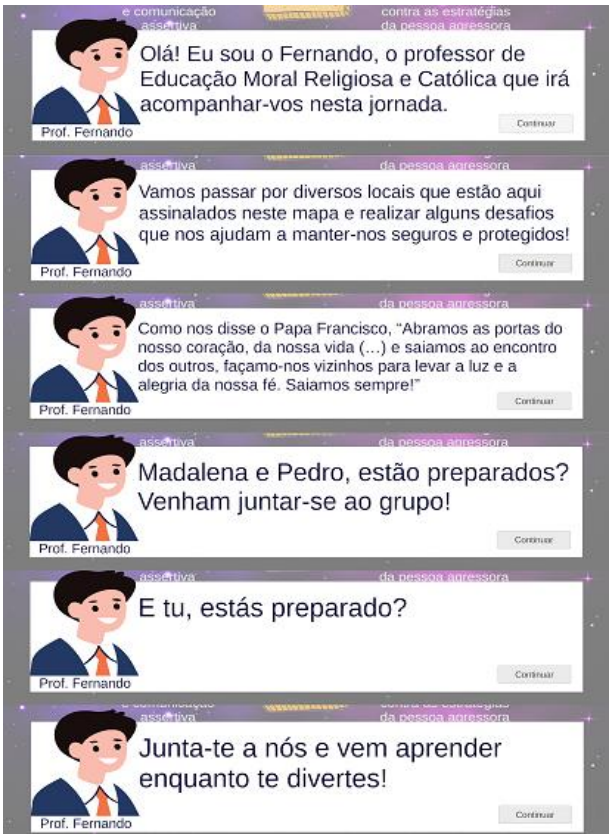


Figure 11. Initial dialogue to introduce the story of the game.



Figure 12. Map for chapter selection.

3.4.1. Chapter 1 - Lighthouse

Chapter 1 starts with the dialogue present on figure 13, where the female child character called "*Madalena*" introduces the player to the action by drawing their attention to an old phone lying on the floor as in visible in figure 14.

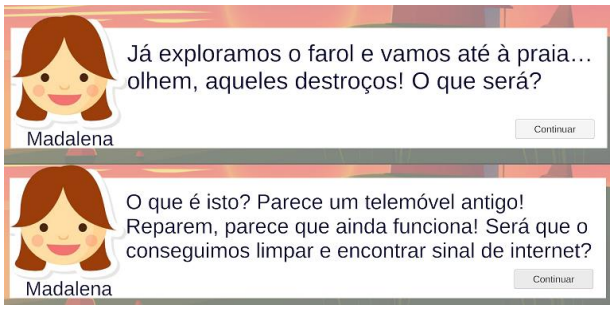


Figure 13. Initial lighthouse dialogue.

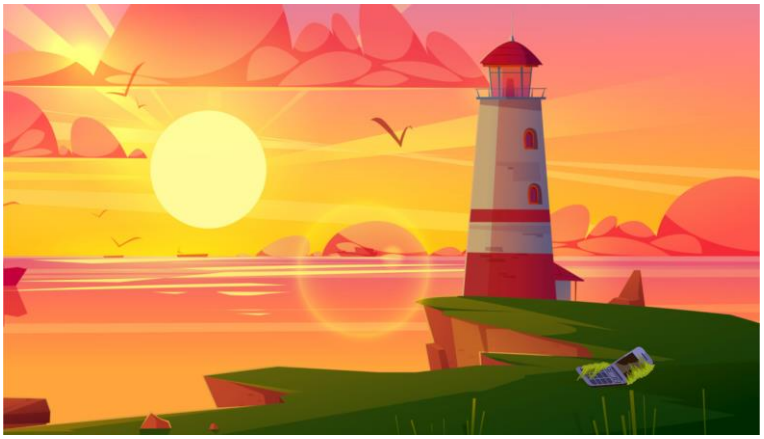


Figure 14. Lighthouse background with phone.

Clean Phone

Interacting with the phone opens the panel present on figure 15, where the player must clean the two pieces of moss on the phone to progress. Simply clicking the moss will remove it.

After the task is completed the dialogue in figure 16 appears where Madalena is congratulating the player and transitioning into the next phase where the interaction occurs inside the phone screen of figure 17.

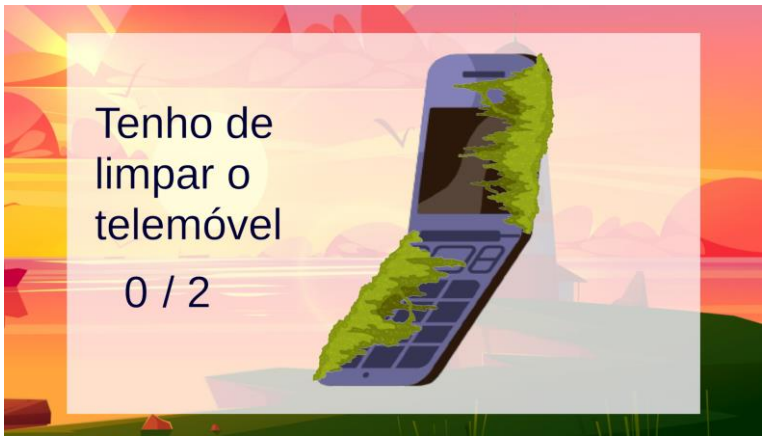


Figure 15. Lighthouse "Clean phone" minigame.

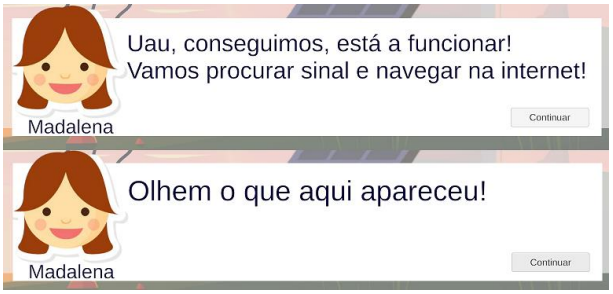


Figure 16. Lighthouse Dialogue after "Clean phone".

Phone Screen

Inside the phone screen is where the player finds four minigames where the first must the completed for the others to be unlocked.



Figure 17. Lighthouse "Phone screen".

Cipher

Upon entering the cipher minigame, the player is faced with three phrases, rules for a safe usage of the internet which miss a word that must be decoded, figure 18.

When clicking each of the rules, the panel present in figure 19 pops up. It shows the phrase and a code which must be deciphered using the keyboard below. Each key corresponds to a letter and must be done correctly for the "*confirm*" button to complete it.

The panel in figure 19 also contains a "*clear*" button, which clears all the previously entered letters on the solution grid. The solution grid is also made up of buttons where each of them contains only one letter and it can be used to clear only one specific letter instead of the entire solution grid.

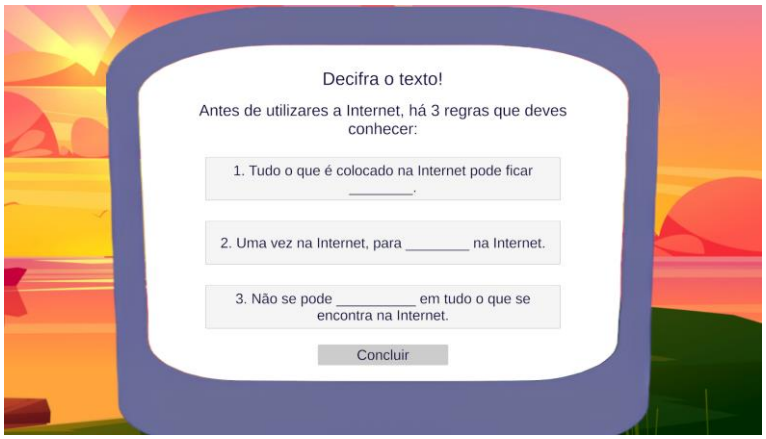


Figure 18. Lighthouse Cipher main screen.



Figure 19. Lighthouse Cipher "Decode" screen.

After all the ciphers are solved the "*finish*" button on figure 18 is finally enabled, allowing for the conclusion of this minigame.

When the cipher minigame is completed, there is a short message by "Madalena" in figure 20, talking about the importance of these rules of the internet.

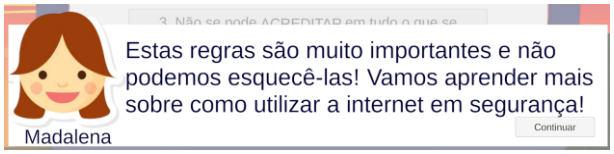


Figure 20. Lighthouse After Cipher Dialogue.

Afterwards the game returns to the phone screen with the indication that the cipher minigame was completed and the other challenges have been unlocked and can now be played, figure 21.



Figure 21. Lighthouse Cipher finished, other minigames unlocked.

Cards

In this minigame, shown in figure 22, the player has 13 cards with are dealt in a random order and they must distribute the cards to the correct stack by dragging the card and dropping where it belongs. Each card has a message and the player must decide is it is something they "*should do*", "*should not do*" or is a "*danger of the internet*".

If they place it correctly, the card stays in the stack with a "*card*" sound effect , if incorrectly there is a "*wrong*" sound effect and the card gets reinserted into the deck and replaced by a new card. Alternatively, clicking the deck also allows to replace the current card.

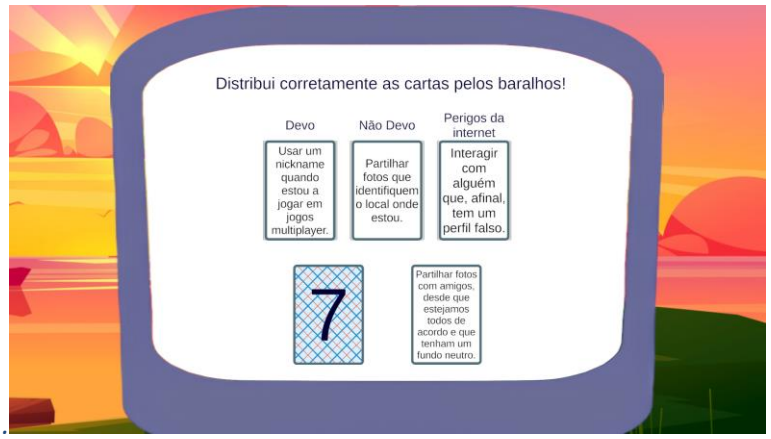


Figure 22. Lighthouse Cards middle.

There is always visible a count of how many cards the deck still contains, after all the cards have been correctly distributed the minigame ends and the application returns to the phone screen with the cards minigame completed.

Wires

The wires minigame, shown in figure 23, has a list of 9 phrases on the left side and 3 matches on the right side. Each three on the left correspond to one on the right. By clicking on the circle in front of the phrases on the left, the wire is started and it is completed when clicking one of the

circles on the right side.

At any time, the player can click the "*clear*" button to remove all the wires or the "*confirm*" button to check their answers, figure 24. The ones that turn green are correct and the ones that turn red are incorrect. They can then re-click the incorrect circles on the left side to start a new wire and when they click on one of the circles on the right it removes the existing wire and creating a new connection.

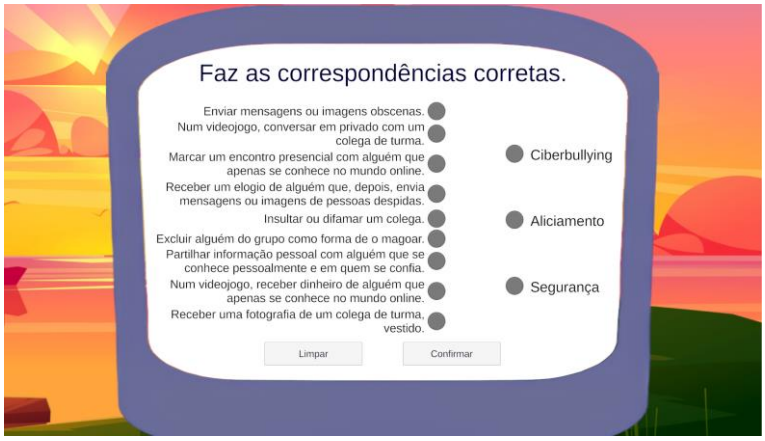


Figure 23. Lighthouse Wires beginning.

At any time, the player can click the "*clear*" button to remove all the wires or the "*confirm*" button to check their answers. The ones that turn green are correct and the ones that turn red are incorrect. They can then re-click the incorrect circles on the left side to start a new wire and when they click on one of the circles on the right it removes the existing wire and creating a new connection.

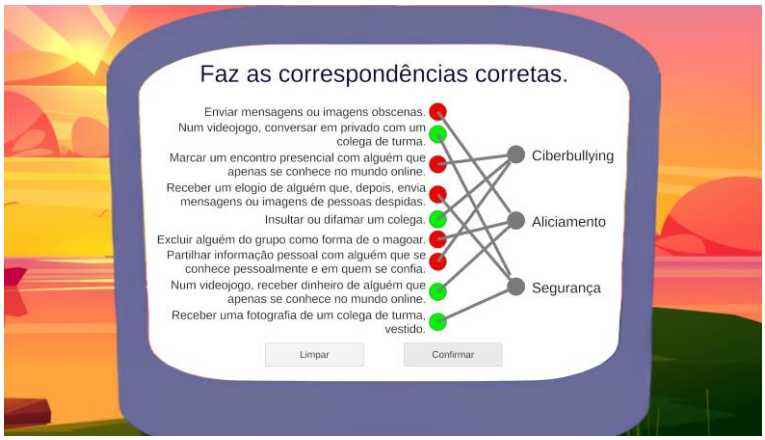


Figure 24. Lighthouse Wires some incorrect.

If all wire connections are correct, clicking a second time in the "*confirm"* button returns to the phone screen with the minigame being completed.

Matching

When entering this challenge, as shown in figure 25, there are five sentences with a word missing and seven possibilities on top. The objective is to drag each of the words into their

correct slots to complete the sentences.

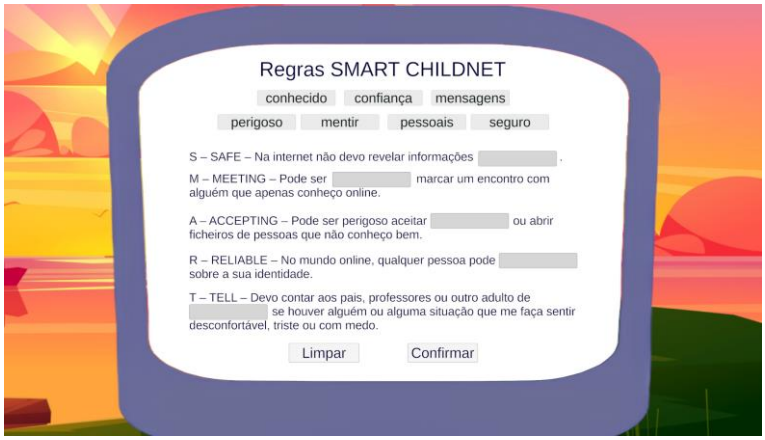


Figure 25. Lighthouse Matching beginning.

When the "*confirm*" button is pressed the words in the correct slots turn green, while the ones that do not belong to that slot turn red, figure 26. The "*clear*" button returns all words to their original color and position, dragging a word out of a slot also returns its color to black and it returns to original position if dropped outside of one of the slots.



Figure 26. Lighthouse Matching some incorrect.

If all slots are correctly filled by the words, clicking again in the "*confirm*" button will return to the phone screen with the minigame being completed.

Whenever all the minigames inside phone screen are completed the dialogue in figure 27 is displayed, where Madalena talks about going to a cliff which is where the chapter is located.

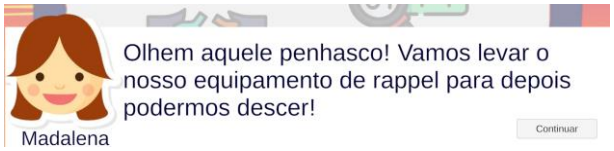


Figure 27. Lighthouse chapter finished dialogue.

After that dialogue ends, there is a panel congratulating the player on having finished the current chapter, figure 28.

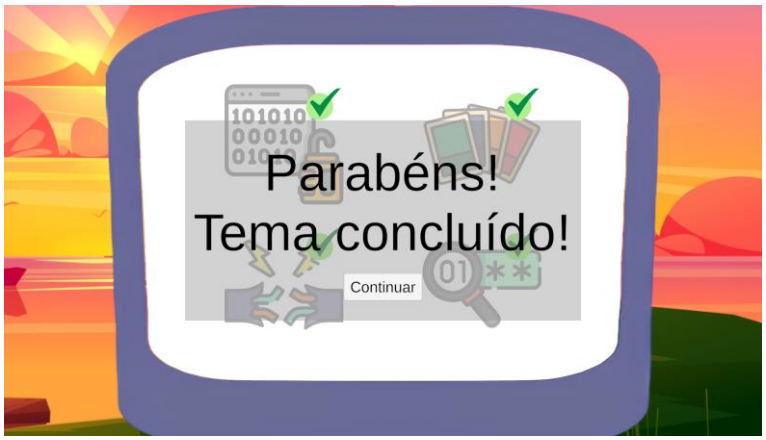


Figure 28. Lighthouse chapter completed.

Clicking the "*continue*" button on this panel leads the player back to the roadmap with the first chapter being completed, figure 29.



Figure 29. Roadmap chapter 1 completed.

3.4.2. Chapter 2 - Cliff

Entering the second chapter, the player is introduced to the male child character called "*Pedro*". He starts the chapter with a dialogue about the current scene and a prayer, in figure 30. Afterwards the minigames on figure 31 can be played.

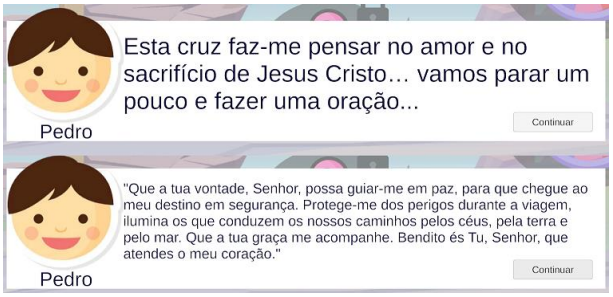


Figure 30. Cliff initial dialogue.



Figure 31. Cliff main screen.

Healthy or Abusive

When opening the healthy or abusive minigame, a dialogue appears featuring Pedro, as seen in figure 32.

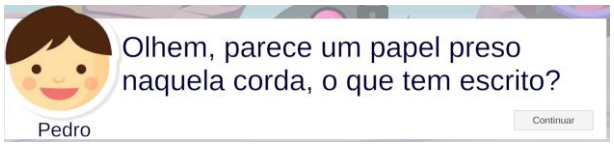


Figure 32. Cliff dialogue before healthy or abusive.

Following that dialogue the minigame can be played, figure 33. Out of twenty four possible papers, eight are pseudo-randomly chosen and must be correctly dragged to the where they belong, either to a healthy or abusive relationship, represented by a backpack and a trash can respectively. There are four papers to each side. When incorrectly placed, the paper is replaced by a new one until all eight have been correctly placed.

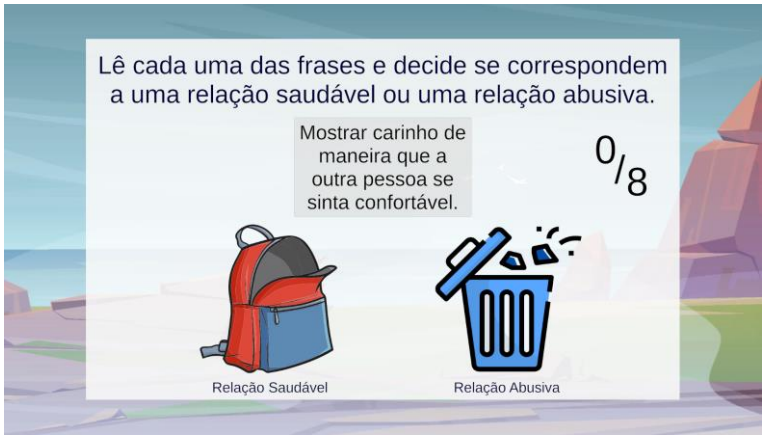


Figure 33. Cliff healthy or abusive.

After finishing the minigame there is a short dialogue where Pedro reflects about learning characteristics about relationships, figure 34, and then the application returns to the main screen where the “healthy or abusive” minigame has been completed and the others are now unlocked, figure 35.

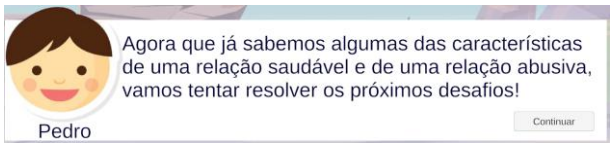


Figure 34. Cliff dialogue after healthy or abusive.



Figure 35. Cliff healthy or abusive finished.

Choices

In the choices minigame out of six possible situations, three are chosen randomly and must be answered correctly. Each situation has three choices for possible answers but only one is correct, figure 36. If the player presses an incorrect choice the situation is replaced by an unanswered one.

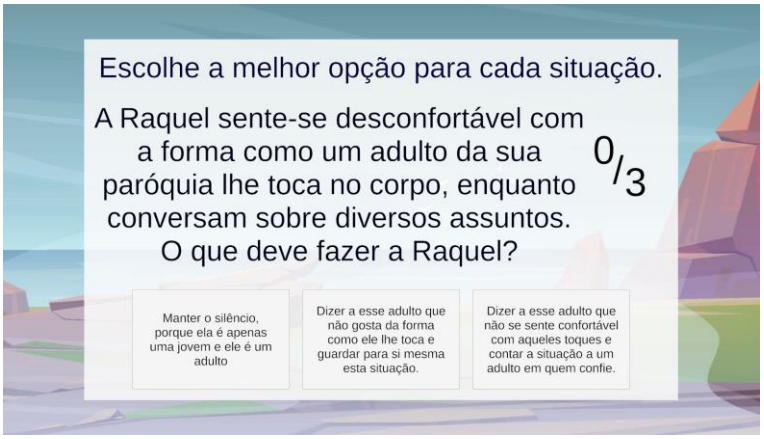


Figure 36. Cliff Choices.

After all the situations are correctly answered there is a new short dialogue by Pedro, also reflecting about what was learnt in this challenge, figure 37, and the game returns to the main screen where the choices minigame is completed.

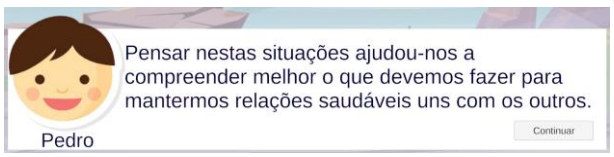


Figure 37. Cliff dialogue after choices.

Roulette

The roulette minigame was adapted from a GitHub made by user "herbou" in https://github.com/herbou/Unity_PickerWheelUI.

Upon entering the roulette minigame shown in figure 38, there are thirty possible roulette problems where ten are chosen pseudo-randomly. When the "*spin*" button is pressed, the roulette spins. As it lands on a number the problems panel opens, figure 39, showing the problem and three answers. Choosing the right answer closes the panel and returns to the roulette screen with the answered problem colored green and the counter incremented, figure 40.

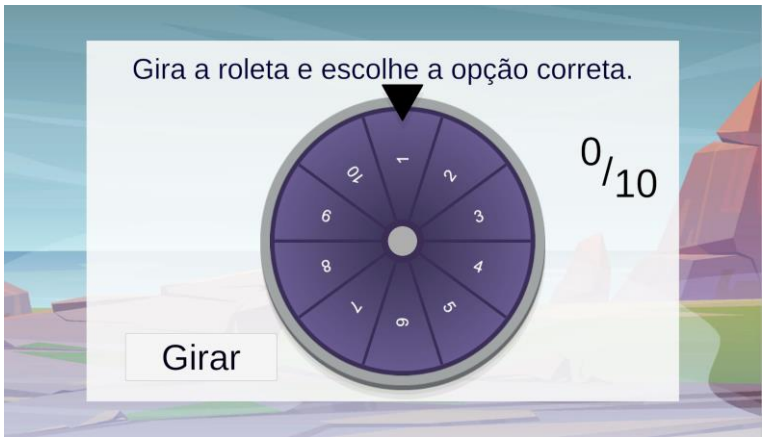


Figure 38. Cliff roulette start.

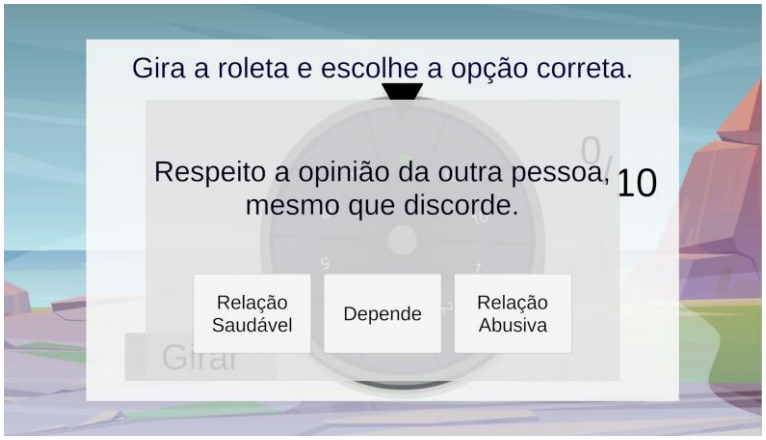


Figure 39. Cliff roulette problem.

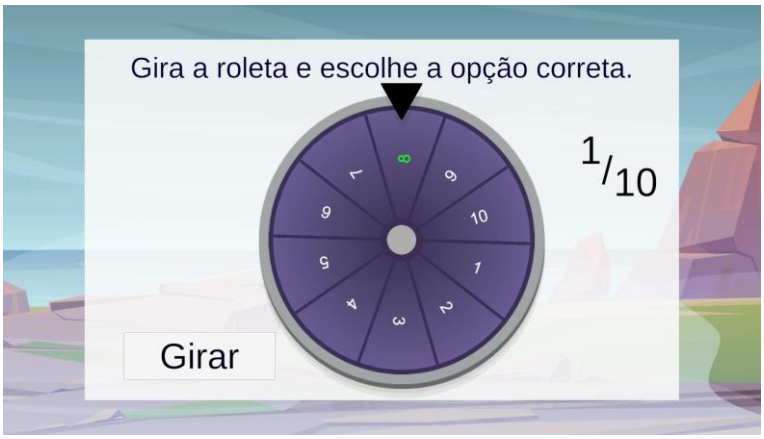


Figure 40. Cliff roulette after problem.

After all ten problems are completed there is a short dialogue by Madalena finishing the chapter and making reference to the next one, figure 41.

Following this dialogue there is a chapter completed message and pressing the "*continue*" button ends the chapter and returns the application to the roadmap with this chapter completed.

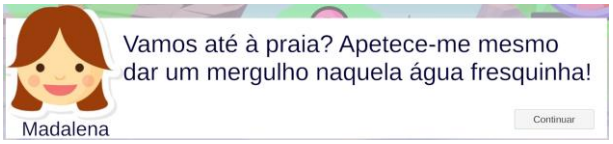


Figure 41. Cliff dialogue after roulette.

3.4.3. Chapter 3 – Beach

When the player enters the beach, there is a short dialogue by Madalena drawing attention to the crab minigame which is the first to be played in this chapter, figure 42. After the dialogue, the application advances to the main screen of the beach chapter displaying the various challenges, figure 43.

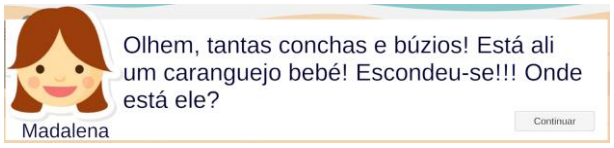


Figure 42. Beach dialogue start.

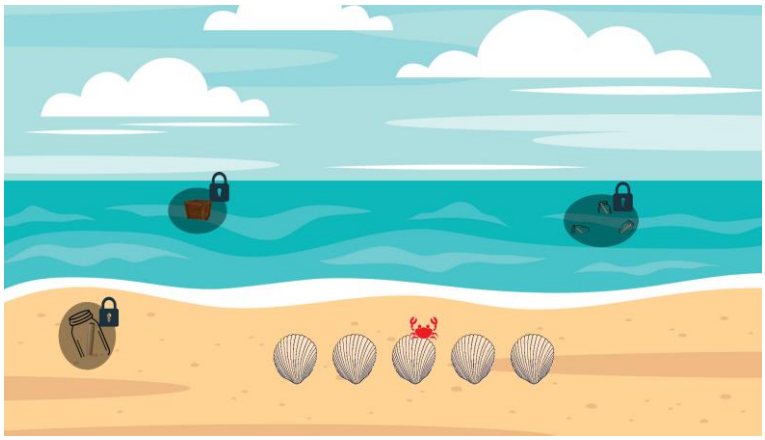


Figure 43. Beach main screen.

Crab

The crab minigame was adapted from a GitHub made by user "ALONUCLEAR" in https://github.com/ALONUCLEAR/Unity-Cup-Mixer/tree/main.

Entering the crab minigame there are 5 shells and a crab in the middle, figure 44. Clicking in the "*start*" button begins the minigame, where the crab hides and the shells start shuffling. After a short time the shells finish shuffling and the player must choose one of the shells, to find which one the crab is hiding under.



Figure 44. Beach crab start

If the player chooses incorrectly, a small "*try again*" message appears along with the return of the "*start*" button. The player then must press the "*start*" button again to reshuffle the shells and attempt to find the crab a second time.

Should the player choose incorrectly a second time, the finish panel appears with the message "*quase!*". If the player chooses correctly the finish panel appears with the message "*boa!*", figure 45.

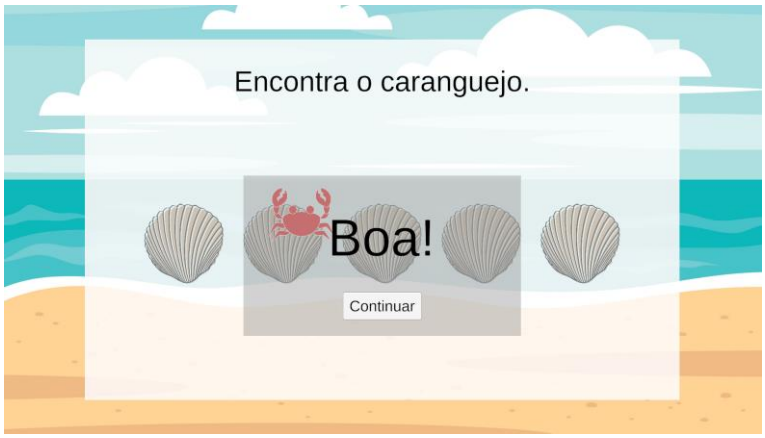


Figure 45. Beach crab correct shell.

Poem

Opening the poem minigame starts a dialogue where Madalena mentions the need to read the poem carefully to solve the challenge, in figure 46.

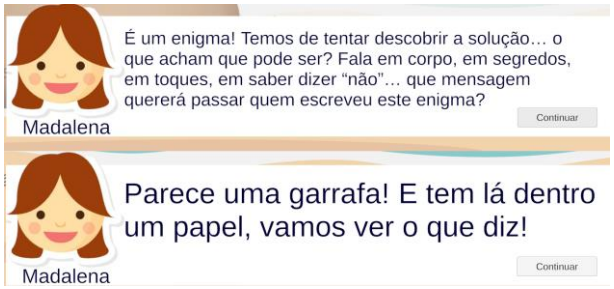


Figure 46. Beach dialogue before poem.

There is a poem on the left side and five options on the right, two correct ones must be selected to complete the challenge, figure 47.

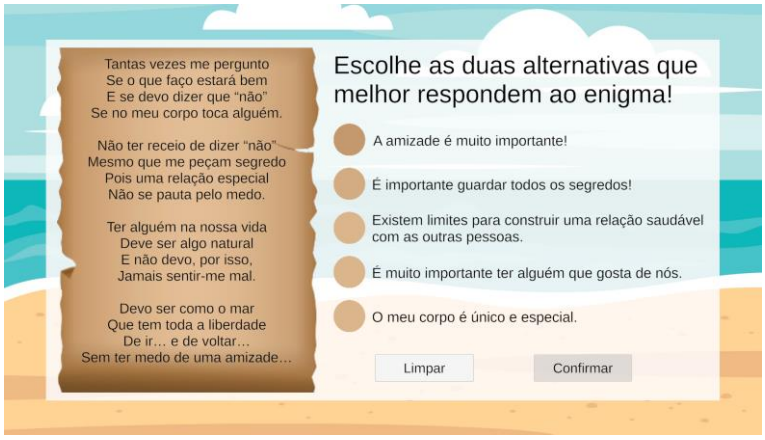


Figure 47. Beach poem main screen.

The answers turn grey after being selected. After selecting the answers are selected, the player must press the "*confirm*" button to verify their answers. If the selected answers are wrong the application plays a "wrong" sound effect and returns to the challenge's main screen.

If both selected answers are correct the answers turn green, figure 48. After both answers

turn green, clicking "*confirm*" button a second time finishes the minigame and the game return to the chapter main screen with the minigame completed.

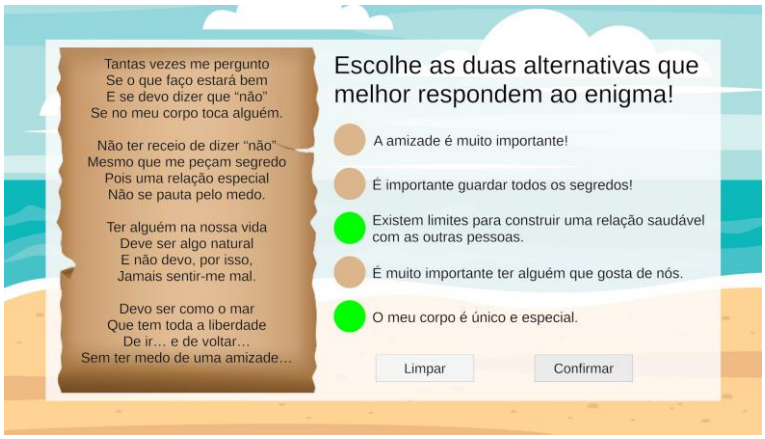


Figure 48. Beach poem answer correct.

Bottles

Entering the bottles minigame displays a ocean water panel with three messages in a bottle, figure 49. These three messages are randomly chosen from possible six problems.

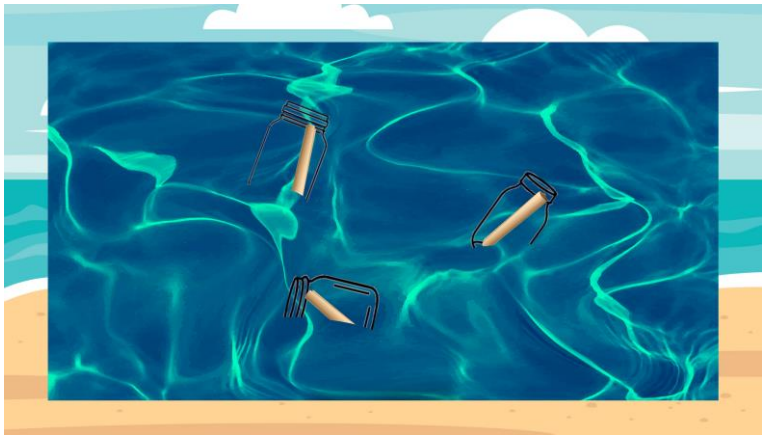


Figure 49. Beach bottles main screen.

When a bottle is interacted the program opens the problem panel, figure 50, which contains a secret and two options, the player must decide if it is a safe or unsafe secret to the kept. If they answer correctly a "correct" sound effect is played, if answered incorrectly a "wrong" sound effect is played.

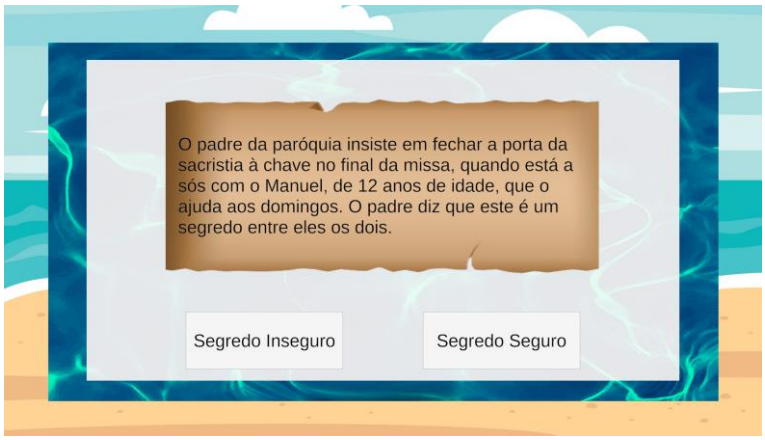


Figure 50. Beach bottles secret.

If the secret is unsafe the unsafe message is shown, figure 51, and if the secret is safe the safe message is shown, figure 52.

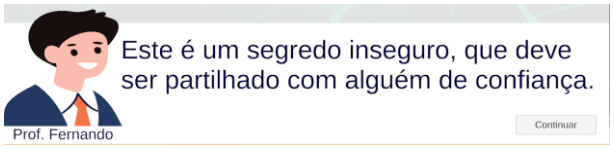


Figure 51. Beach bottles unsafe message.

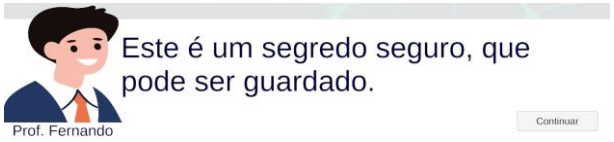


Figure 52. Beach bottles safe message.

Linking

Entering the linking minigame, two columns are presented each with eight half sentences, figure 53. The player is expected to match each half sentence on the left with the correct one on the right side. Each one has a different match so all of them get paired up.



Figure 53. Beach linking start.

Similarly to the wires minigame previously described in section 3.4.1.5, to create connections the player must click on the circles on the left to start the wire and on the right to finish the connection. At any point, the player can hit the "*confirm*" button which turns the left

circles of all the correct connections green and the wrong connections red, figure 54.

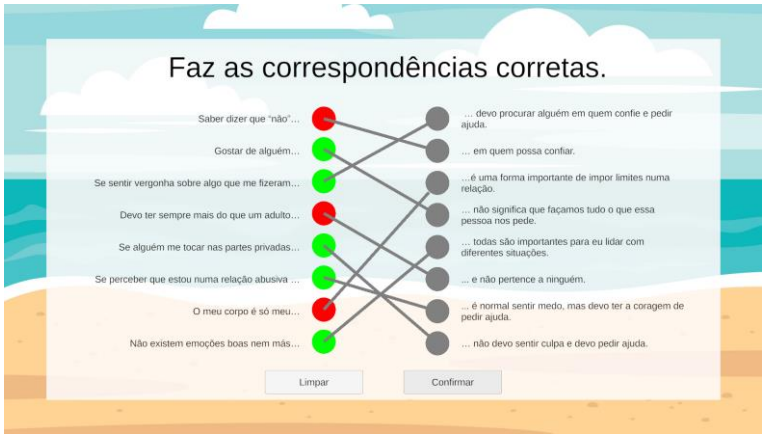


Figure 54. Beach linking some incorrect.

They can then correct their mistakes until all connections are correct. When all connections are correct, pressing the "*confirm*" button once again finishes the challenge.

Boat

When all the other challenges of this chapter are completed the dialogue, present in figure 55, appears. It is a conversation between Pedro and Prof. Fernando about the next minigame that appears immediately after this conversation.

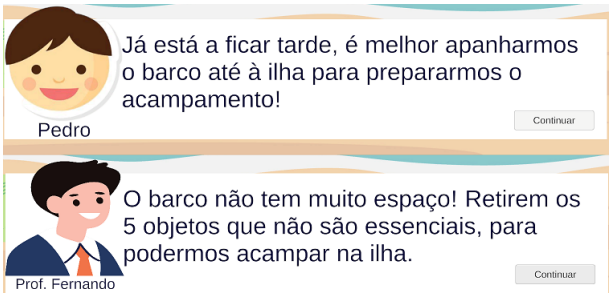


Figure 55. Beach dialogue before boat.

The challenge is to remove the five non essential items from the boat that will take them to the next chapter. The boat, in figure 56, has ten items in total and five of them must be selected and removed from the boat to finish the minigame.



Figure 56. Beach boat start.

After the minigame is completed, the application returns to the chapter main screen to display the finished chapter message, and after that it returns to the roadmap with this chapter completed as well.

3.4.4. Chapter 4 - Chapel

When the player enters this chapter there is a conversation between Prof. Fernando and Pedro. It helps transitioning into the first minigame by introducing the topic of green, yellow and red flags, figure 57. After the dialogue is over, the game proceeds to the main screen of this chapter, figure 58.

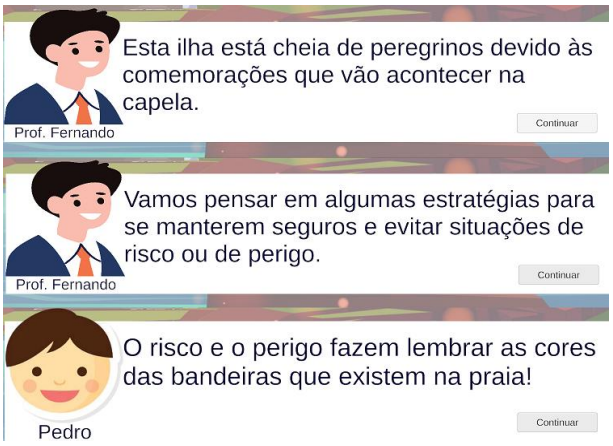


Figure 57. Chapel dialogue start.

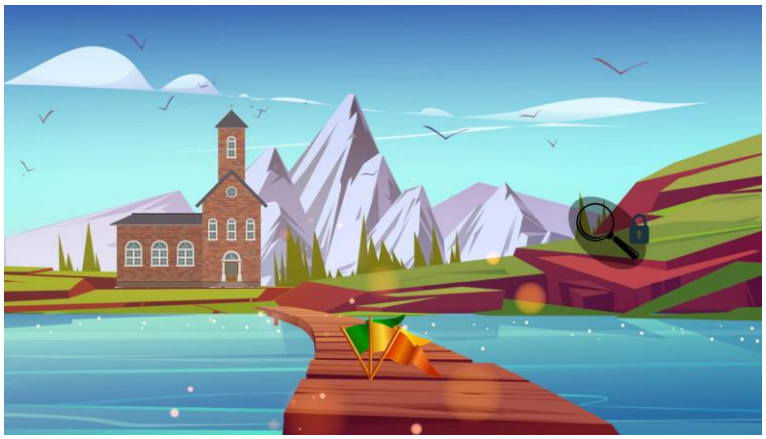


Figure 58. Chapel main screen.

Flag Info

Once the player presses the flags icon, the flag info minigame appears, figure 59. In this minigame there is some important information regarding the different flags, what they mean "*ok*", "*risk*" and "*danger*" as well as what types of situations can correspond to each flag. After carefully reading and understanding, the player can hit the "*continue*" button to advance unto the flag minigame.



Figure 59. Chapel Flag Information screen.

Flag

After passing through the flag information the flag minigame screen appears, keeping the flags but this time also having cards with situations that the player must decide which flag corresponds with the situation depicted in the card, figure 60. There are a total of twelve possible cards, six of which are chosen pseudo-randomly to result in 2 of each type of situation. The cards must be dragged to the correct flags. If a card is dragged to the wrong flag there will is a "wrong" sound effect and the card is replaced by a new one.



Figure 60. Chapel Flag main screen.

When all six cards are placed in the correct flag the minigame ends and the game returns to the chapter main screen with the flag minigame completed and the other challenge unlocked.

Detective

When opening the detective minigame, there is a dialogue by Prof. Fernando introducing the objective of the challenge which is to find the clue that help identify people able to put the player in risk or in danger, figure 61.

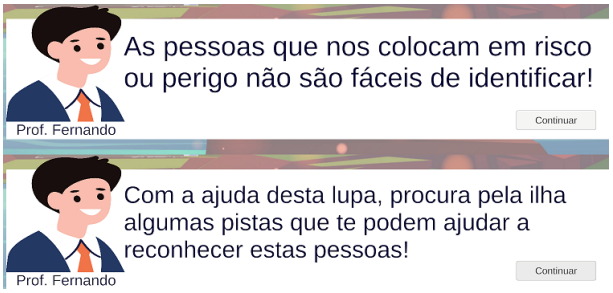


Figure 61. Chapel dialogue before detective.

After that dialogue the detective minigame opens with the objective to "*find the three hidden myths*", there is a magnifying glass and several bushes, figure 62. The magnifying glass is able to be dragged across the screen and with it the player can discover sentences hidden behind the bushes.



Figure 62. Chapel detective dragging magnifying grass.

Releasing the magnifying glass on the myths dispels the myth and reveals the truth, showing the myth in red and the truth in cyan, figure 63. If the magnifying glass is released on a sentence that is not a myth, the sentence also turns into cyan. After all three myths are revealed there is a "*success*" sound effect and a "*exit*" button appears on the top right and when the player pressed it, the minigame is completed and the game returns to the chapter main screen.



Figure 63. Chapel detective all myths found.

After all challenges are completed the "*chapter finish*ed" message appears, and then it returns to the roadmap with this chapter completed.

3.4.5. Chapter 5 - Bonfire

The final chapter starts with a dialogue from Madalena, figure 64, explaining the necessity to start a fire to help guide a boat to shore using it's light much like a lighthouse. Afterwards advancing to the chapter mains screen, figure 65.

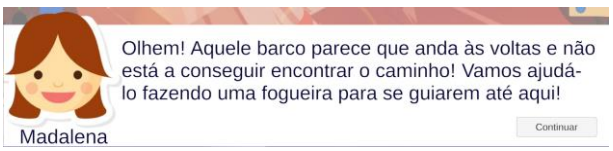


Figure 64. Bonfire dialogue start.

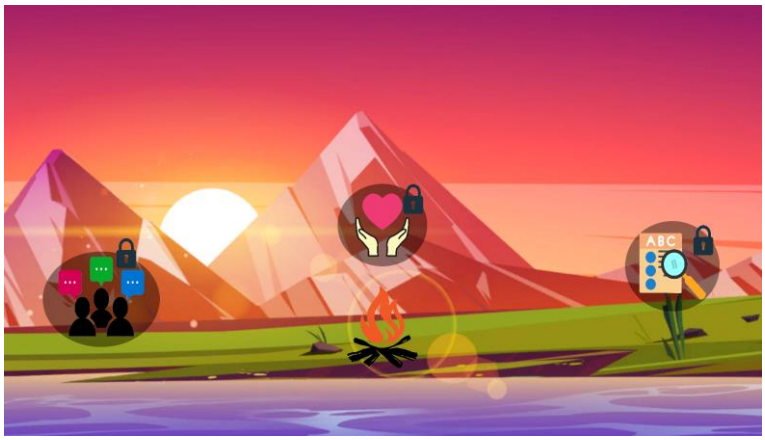


Figure 65. Bonfire main screen.

Bonfire

Starting the bonfire minigame, there are three images of firewood which need to be grabbed to the center where is situated the shade of a wood pyre, figure 66.

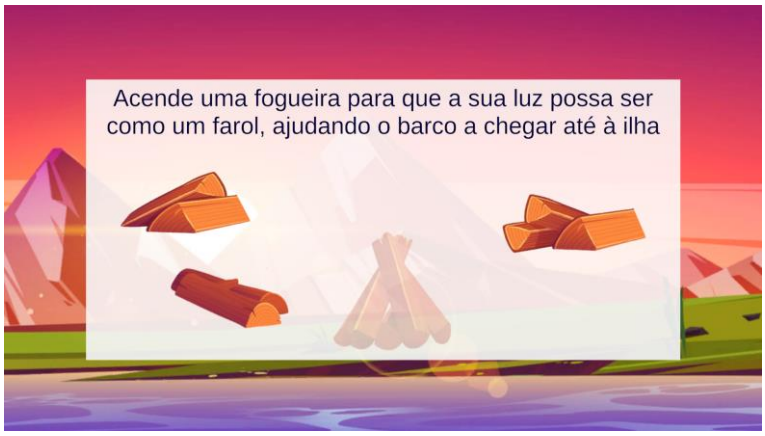


Figure 66. Bonfire fire first screen.

After building the wood pyre, a lighter appears on the right side which also needs to be dragged to the center, figure 67, lighting the fire and causing a "*congratulation!*" message to appear, figure 68.

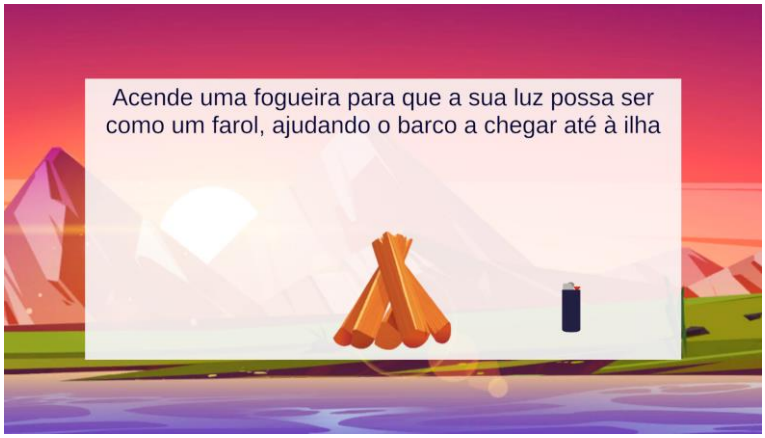


Figure 67. Bonfire fire second screen.

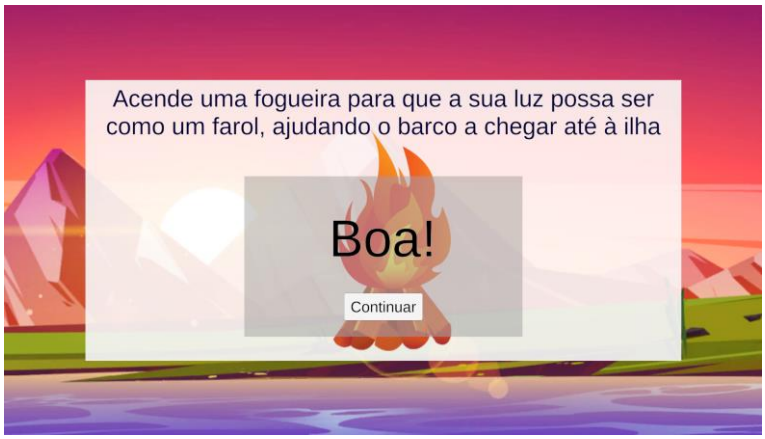


Figure 68. Bonfire fire end.

Pressing the "*continue*" button on this message ends the minigame and returns the application to the chapter's main screen with challenge completed and the others unlocked, figure 69.

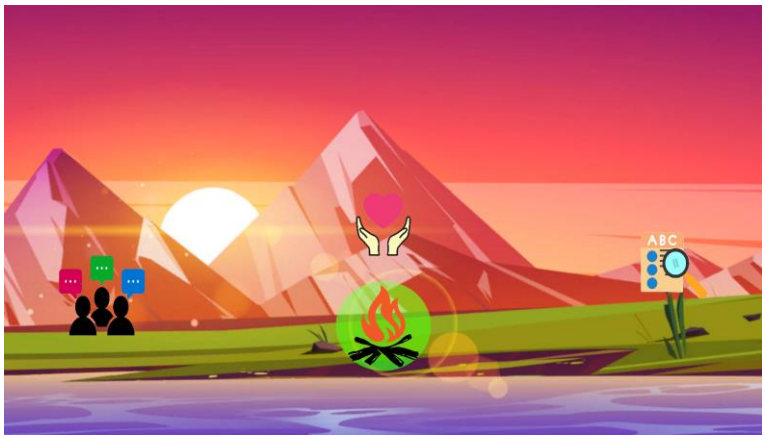


Figure 69. Bonfire fire completed.

Word Search

The word search minigame was adapted from a GitHub made by user "williamrjackson" in https://github.com/williamrjackson/WordSearch.

Before entering the word search, a message from Madalena appears where she comments the situation of the boat, about feeling lost and how it's important to ask help from people that are trusted, figure 70.

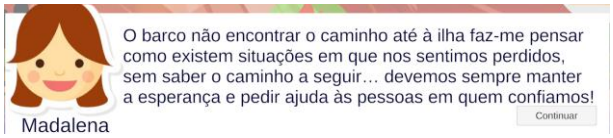


Figure 70. Bonfire dialogue before word search.

After the dialogue, the minigame opens and there is a word search where out of sixteen possible words, five randomly chosen must be found. On the right side is the word search and

on the left side is a list of the words which need to be found. Clicking on one of these words generates a short-lived trail in the location of that word, figure 71. The words may appear in any orientation including backwards and diagonals.

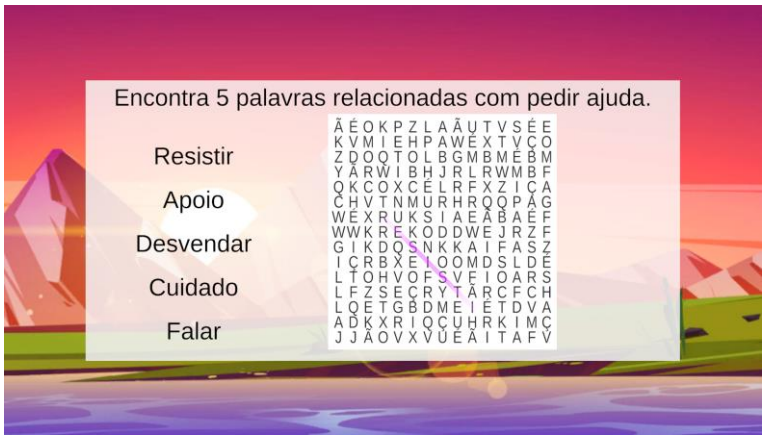


Figure 71. Bonfire word search hint.

To capture a word the player must drag from either the first or last letter of the word and release on the other end. After successfully capturing a word, the letters stay highlighted and the word on the list to the left gets crossed out, figure 72, and a "success" sound effect is played.

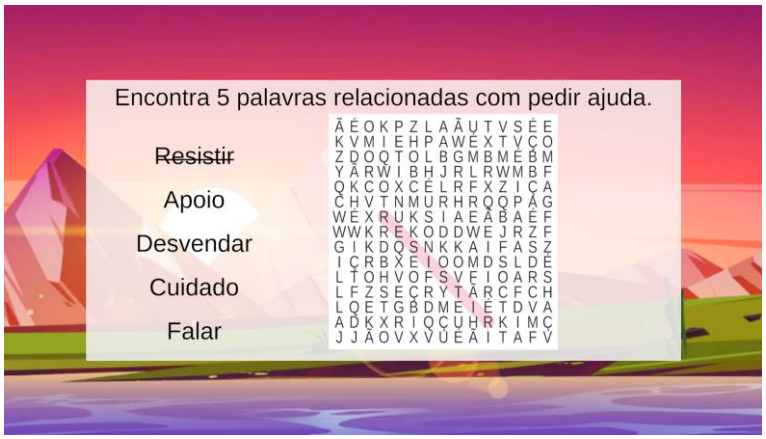


Figure 72. Bonfire word search word found.

When all five words have been captured the "*congratulations*" message appears and when its "*continue*" button is pressed the game returns to the chapter's main screen with the minigame completed.

Situations

Upon entering the situations minigame there are four situations each with four choices with only one correct, figure 73.

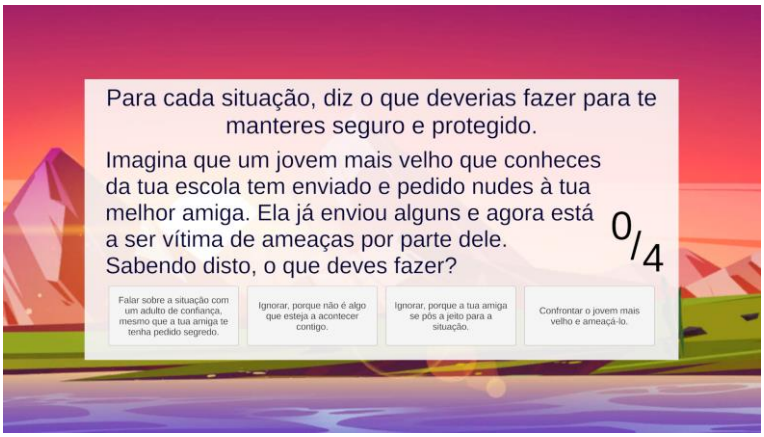


Figure 73. Bonfire situations main screen.

When the player chooses incorrectly there is a dialogue by Prof. Fernando saying to try again and explaining that it's important to feel comfortable and protected, figure 74.

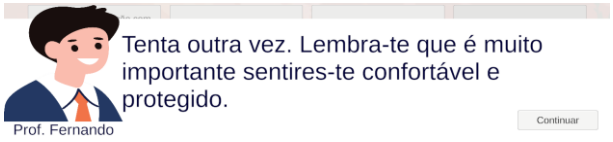


Figure 74. Bonfire situations wrong message.

If the player answers incorrectly twice the teacher simply says what the correct answer it for that situation, figure 75.

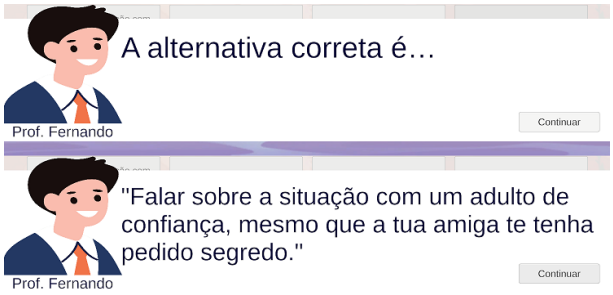


Figure 75. Bonfire situations second wrong message.

When the player answers correctly the teacher congratulates the student and further explains how important it is to ask for help and to not give up until someone does help, figure 76.

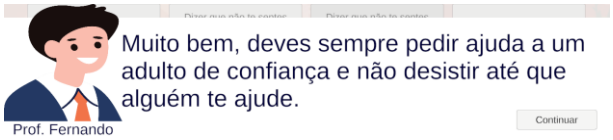


Figure 76. Bonfire situations correct message.

Trust

The trust minigame is meant to symbolize a conversation or a string of thoughts around a campfire, where the player identifies what it means to be a person of trust or a confidant.

In figure 77, there is a fire and eight smoke clouds with words that can answer the sentence

"*a person of trust is someone that...*" and the player is expected to identify the three smoke clouds that do not complete that sentence correctly and drag them into the fire to make them disappear.

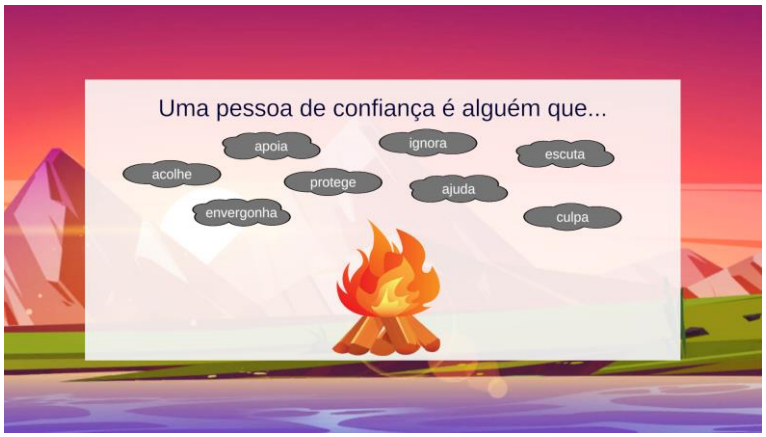


Figure 77. Bonfire trust main screen.

After all the "*wrong*" smoke clouds are gone, a "*congratulations*" message appears and when its "*continue*" button is pressed there is a new dialogue from Madalena stating that everyone has people they can trust and those are always the people that must be relied on when asking for help, figure 78.

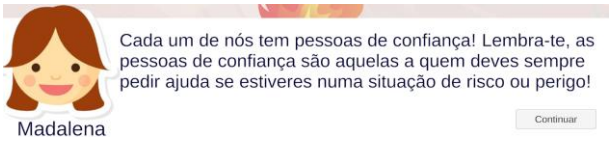


Figure 78. Bonfire dialogue after trust.

After the dialogue is finished the application returns to the chapter's main screen with the challenge being completed. When all the chapter's challenges are completed, the "*chapter completed*" message appears, and when its "*continue*" button is pressed, the game returns to the roadmap with this chapter completed.

CHAPTER 4

Evaluation

In this chapter there will be a description of the focus group, the questionnaire's questions used and reasoning, what results were obtains, suggestions and notes taken from their interactions with the product and what conclusions were made based on both the questionnaire results and the notes.

4.1. Focus group

The focus group were 32 children between 10 and 14 years old. They were divided into four presentations in different time periods based on their school grade which went from 6th grade to 9th grade, shown in figure 79. In each presentation there was a computer running the software with the game also being shown in a large television. The children were formed into groups of three and each group sat at the computer playing the game, narrating what was showing on the screen. The others were participating from their seats resulting in debates when solving challenges.

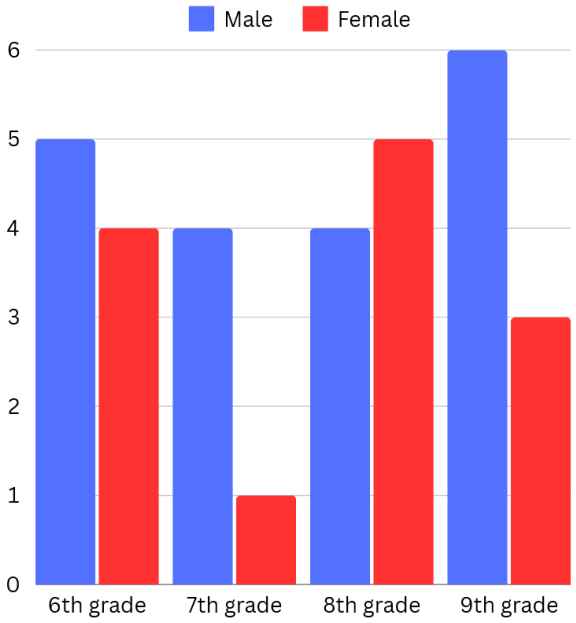


Figure 79. Focus group divided by grade and gender.

4.2. Questionnaire

The questionnaire's questions used were based on "*Adaptation of the System Usability Scale for User Testing with Children*" [9]. The "*System Usability Scale*" or SUS questionnaires use ten questions with a scale from one to five and "*is considered a quick, reliable and valid method for assessing learnability and usability*" [9].

This study [9] adapted and tested the SUS so that it can be used with younger children. Each of the 10 questions of the SUS has been adapted to two age brackets 7-8 and 9-11. For the purposes of this project the questions used were those adapted to 9-11 age bracket. The study [9] also added three new questions which can not be used to calculate the SUS usability score, however we believe there was no negative impact on using those three additional questions, even if simply to have more data to draw some type of conclusion. These questions were then translated from English to Portuguese so they could be understood by Portuguese children taking the questionnaire. It was also added an age, sex, group and a box at the bottom to add any suggestions they might have, figure 80.

Questionário

Idade	Sexo	Grupo

1. Discordo totalmente 5. Concordo totalmente

Perguntas	1	2	3	4	5
1. Se tivesse esta aplicação no meu iPad, acho que gostaria de a jogar muito.					
2. Fiquei confuso muitas vezes quando estava a jogar.					
3. Achei a aplicação fácil de utilizar.					
4. Precisaria da ajuda de um adulto para continuar a jogar.					
5. Sempre senti que sabia o que fazer a seguir quando jogava.					
6. Algumas das coisas que tive de fazer ao jogar a aplicação não faziam sentido.					
7. Penso que a maioria dos meus amigos aprenderia a jogar a aplicação muito rapidamente.					
8. Algumas das coisas que tinha de fazer para jogar a aplicação eram um pouco estranhas.					
9. Estava confiante quando estava a jogar.					
10. Tive de aprender muitas coisas antes de jogar a aplicação bem.					
11. Gostei muito de jogar a aplicação.					
12. Se tivéssemos mais tempo, eu continuaria a jogar a aplicação.					
13. Tenciono falar da aplicação aos meus amigos.					

14. Têm alguma sugestão sobre as atividades que realizaram?

Figure 80. Questionnaire given to focus group.

4.3. Results

In figure 81, there is a graph displaying all the SUS scores in the questionnaire filled by the focus group divided by their grade as well as the grade's average score in black color with its value in front. We can see that the scores improve with the increase of the grade, which makes sense considering the age difference, they had fewer difficulties understanding what the application wanted from them. The exception is the 7th grade which might be because it is the only grade with only five participants and it is one of only two groups with one score very differently than the others. If we assume this number is an outlier, the average of the other scores in the 7th results in 83.75 which is more aligned with the other results.

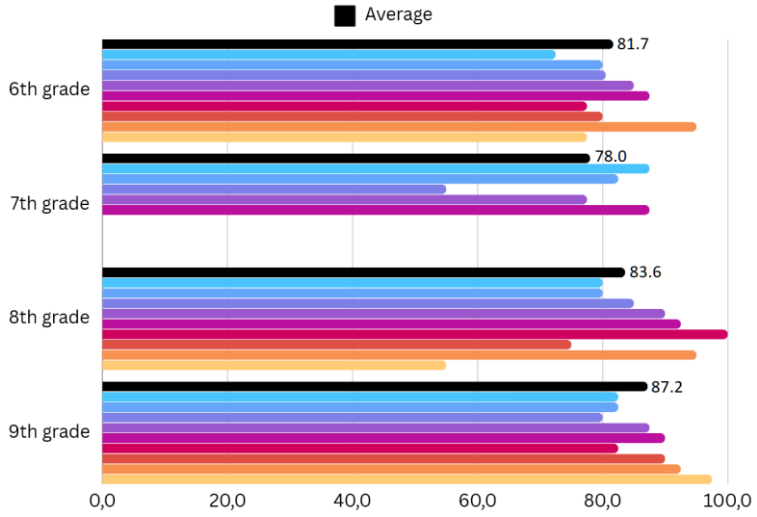


Figure 81. SUS scores divided by grades with averages.

According to [10] "*(...) the average score is 68. This means SUS scores higher than 68 can be considered above average*" and "*Scores above 79 put you in the 85th percentile* (...) *the top 15% of all applications tested*".

The average SUS score of all this application's questionnaires is 83.2, meaning that following the graph in figure 82, the SUS score of 83.2 should be around 90th percentile or in other words in the top 10% when it comes to usability and learnability.

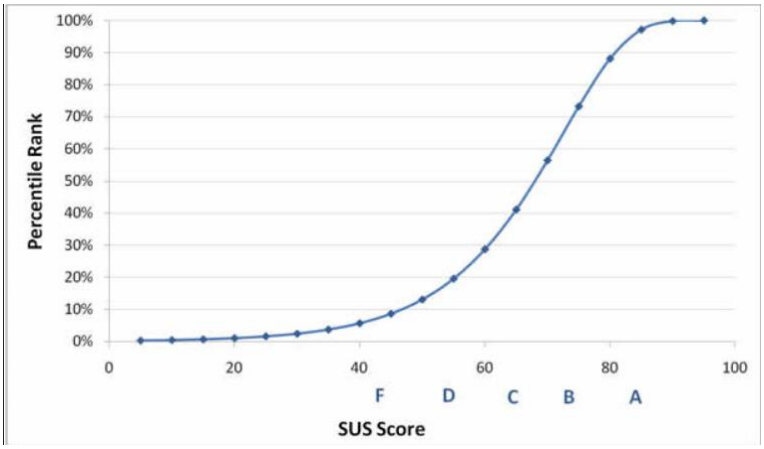


Figure 82. Raw SUS scores as percentiles and grades. [10]

Figure 83 shows that even though males and females had very similar average in their SUS scores, their standard deviation was much different. Females only having 4.96 while males had 12.06.

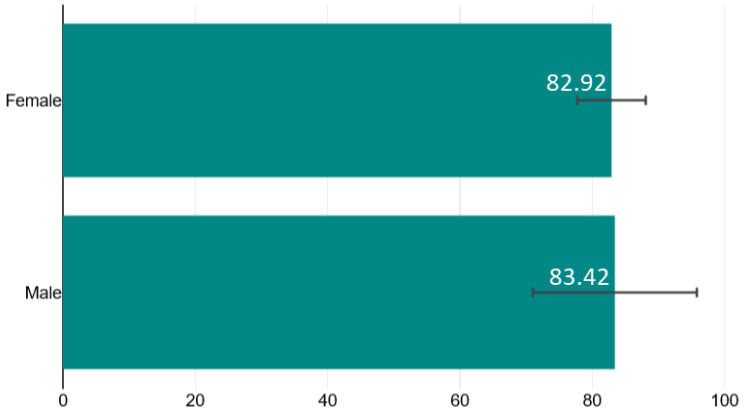


Figure 83. SUS score averages of males and females.

The last three questions of the questionnaire "*Enjoyed playing the game*", "*If I had more time, I would continue to play the game*" and "*Will talk to my friends about the application*", their results and averages visible in figures 84, 85 and 86.

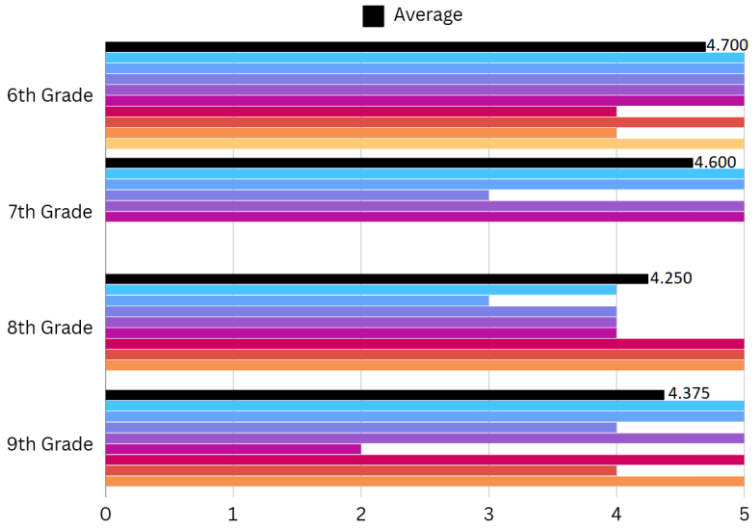


Figure 84. "Enjoyed playing the game" from 1 to 5 divided by grade with averages.

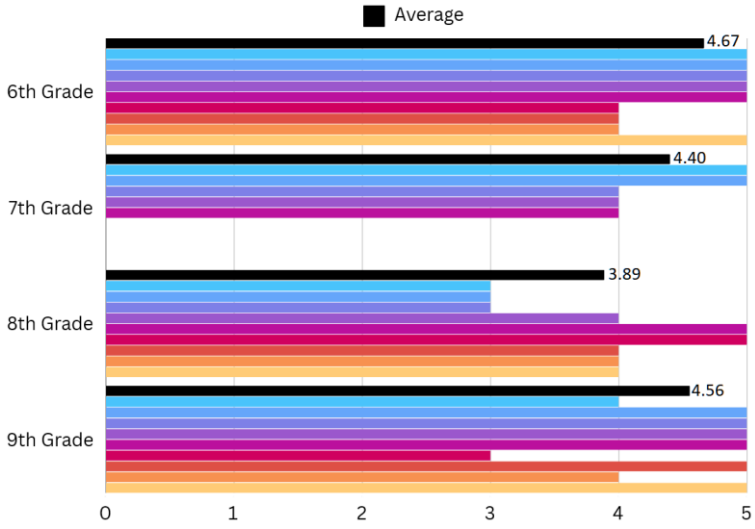


Figure 85. "If I had more time, I would continue to play the game" from 1 to 5 divided by grade with averages.

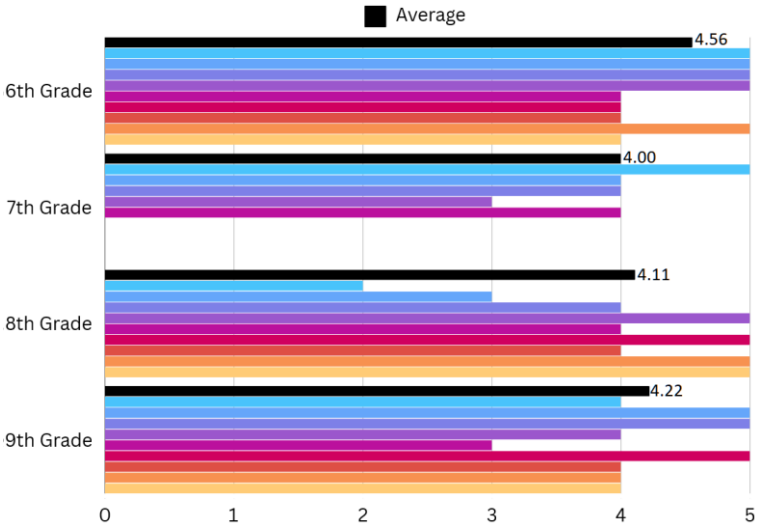


Figure 86. "Will talk to my friends about the application" from 1 to 5 divided by grade with averages.

Based on these graphs from figures 84, 85 and 86, some things are clear to see. Even though all of them enjoyed playing the game, the younger players (6th and 7th grade) enjoyed the experience the most. The 8th grade was the group that enjoyed playing the least as well as the least likely to continue playing. The 6th grade was also the most likely to share their experiences playing the game to their friends even though all grades had a fairly willingness to talk about the application.

4.4. Suggestions

Regarding their suggestions, 17 out of 32 did not suggest anything but there was still almost half of them (46.875%) that did have suggestions that they wrote down, figure 126.

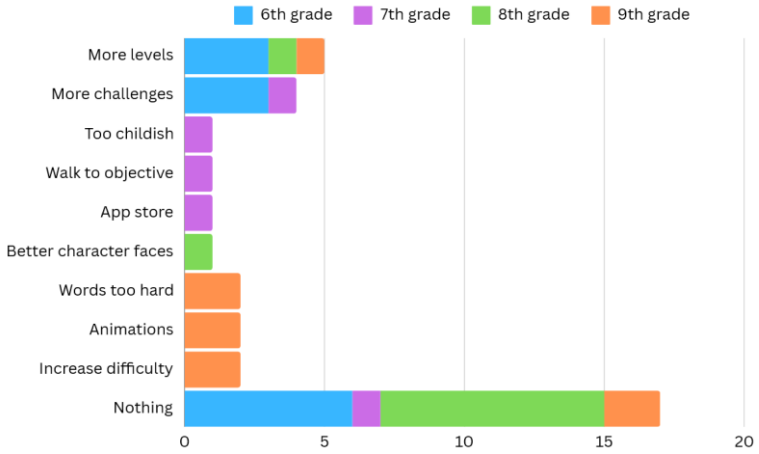


Figure 87. Number of each suggestion divided by grades.

We can see that the most common suggestions were to make the game longer with more chapters/levels and additional challenges and all player groups agreed on that. Some in the 7th grade added that some pictures were a bit too childish, they also expressed a desire for more exploration by walking to the different challenges rather simply clicking on it as well as wanting to have the game on a digital store front like the "*app store*" where they could download the game and play it for themselves. The 8th grade added the fact that the character's faces could have been better quality. The 9th grade was the most vocal with their demands claiming that for a game targeted at people as young as 10 years old, some of the words were too hard to understand. They also showed a desire for some animations to make it more visually appealing as well as wanting the game to have been more challenging seeing as it was too simple for their age of around 14 years old.

4.5. Notes

These are the notes taken during the different groups' interactions with the game and which ways the project could be improved based on their immediate reactions and comments.

Lighthouse

In the "*clean phone*" minigame, figure 16, none of the groups had any trouble, the 9th grade did try to drag the moss to clean instead of clicking but they quickly figured out the solution.

In the "*cipher*" minigame, figure 20, the younger groups took a little more time to understand what they needed to do but there was no issues, the 6th grade was the only group that discovered that clicking one of the letters in the "*solution panel*" clears only that letter, but the other groups did not need to clear at all.

In the "*cards*" minigame, figure 24, there were some difficulties of which cards should be between "*Should not*" and "*Dangers of the internet*", there should be some changes made to the texts to better differentiate between the two groups. There was also a common issue of not immediately understanding that the cards would change after an error, maybe the feature should be removed or there should be different colored texts and/or backgrounds for each card.

In the "*wires*" minigame, figure 25, there was some trouble with the meaning of the words "*obcenas*" and *"aliciamento*", these words should be changed so that the target audience can understand them more clearly. There was also some difficulty discovering that they were meant to click instead of dragging to create the wires, if possible the wires could be created by dragging, and how to recreate the wires when they were incorrect, perhaps removing the wires automatically when incorrect after pressing the "*confirm*" button.

In the "*matching*" minigame, figure 32, there was some difficulty reading the English words for the younger groups but no group displayed any issue playing.

Cliff

In the "*healthy or abusive*" minigame, figure 40, all groups had issue understanding that the cross was an icon to be clicked and claimed it looked too much like background, changing the icon should fix the issue. In the minigame, figure 42, the groups had trouble understanding the word "*assimetria*" in one of the cards, this text would need to be changed. There were also slight problems with the detection in dragging to the correct spot, perhaps the slot should be bigger.

In the "*choices*" minigame, figure 45, there were some complaints about the amount of text being excessive, the text should be reduced. There was also some laughter and concerns about using names of people in some problematic scenarios, the names could be changed to

pronouns.

In the "*roulette*" minigame, figure 48, the 6th and 7th grade had the initial instinct to click the center of the roulette to spin it before noticing the "*spin*" button, maybe the button could be moved to the center.

Beach

In the "*crab*" minigame, figure 56, there were some issues in the shuffling of the shells due to the difference in hardware, changes must be made to the code to fix the issue.

In the "*poem*" minigame, figure 64, there was some difficulty in understanding if one of the answers was correct when pressing the "*confirm*" button.

In the "*bottles*" minigame, figure 69, the younger groups had some doubts about the meaning of "*safe secret*" and "*unsafe secret*", perhaps there could be an explanatory text. The 7th grade had a question about the fact that bottle icon in figure 72 turns green even though they answered the question incorrectly, should only turn green when answered correct.

In the "*linking*" minigame, figure 74, there were difficulties due to the challenge having a lot of text and some sentences are a bit hard to understand what the correct answers are, the texts could be changed to simplify. There was also some difficulty in fixing the incorrect wires and perhaps the incorrect wires should be removed to facilitate visibility at the end.

In the "*boat*" minigame, figure 78, basically all the groups had doubts and believed the pillows should stay on the boat, the pillows should be replaced by other item.

Chapel

In the "*flags*" minigame, figure 85, there were some issues about the detection of the cards into the flags on most groups, the detection should be bigger. The two younger groups had trouble understanding the meaning of certain phrases like "*pernoitar*" and "*número suficiente de adultos*", those texts should be changed.

In the "*detective*" minigame, figure 88, basically all groups did not know what they were supposed to do, the 8th grade was the only group able to discover by themselves, unsure what the best change would be to make it more understandable, perhaps changing the title's text to better reflect what they are supposed to do. The youngest group had trouble with understanding the meaning of the word "*mito*", the word could be changed.

Bonfire

In the "*bonfire*" minigame, figure 97, it was not obvious for the 7th grade group that they needed to drag the wood to the center, otherwise no problems were detected.

In the “*word search*” minigame, figure 102, no group discovered hints by pressing words on the left but there were no issues, maybe it should be text explaining.

In the “*situations*” minigame, figure 107, the players complained about too much text, otherwise everything went well, the text should be reduced.

In the “*trust*” minigame, figure 112, there were some doubts around what they were meant to do but they were able to complete it without help fairly quickly, maybe the text should be changed to be more direct.

CHAPTER 5

Conclusion and Future works

5.1. Decisions for future work

Here are some ideas that were planned for implementation but, due to the time constraints, they were not developed at this stage: more chapters involving different topics, bigger chapters featuring more exploration and more challenges, being able to save your progress and resume at a later time, having multiple save files to store the progress of different groups of people when playing this game, being able to freely change chapters to allow the players to switch between the topics that were being taught, being able to repeat any chapter or challenge without starting a new game, having a character creation.

These topics are going to be considered in the near future while the hired Illustrator and Designer create the final items that will replace the lent material that was used for Low-Fidelity development.

5.2. Conclusion

This dissertation's main purpose was the implementation of a working prototype, building a serious game to be used in a classroom environment to teach children aged between 10 and 14 about sexual abuse, safe relationships and risk situations.

The literature review was important to understand what types of content/projects already existed, how well they thrive, and the low amount found was shocking and reinforced the need for more of these tools to be produced.

In this work's development there were definite hardships mostly unavoidable due to the fact that this project was only possible through the joint effort of two groups: the "psychology group" responsible for the content and the "engineering group" responsible for the programming, as well as not having designated artist/visual designer/UX/UI expert which caused the project's image assets and layouts to not live up to their potential. There are also many things which can be improved about such an application, based on the suggestions and the notes previously demonstrated, in all aspects: code, layouts, images used and content.

The results obtained allows to conclude that it was very well received with a SUS score of 83.2 (~90th percentile), average scores out of five of 4.48, 4.38 and 4.22 in "*Enjoyed playing*",

"*Would like to continue play*ing" and "*Will talk to friends about game*" respectively. The main suggestions being to develop more levels and challenges also show the extraordinary potential of such a game and the target audience's willingness and availability towards the subject matter.

Even though the game was so well accepted, according to the questionnaires and discussions in person with the target audience, it was clear there was a divide between the younger two groups (6th and 7th grade) and the older two groups (8th and 9th grade). The older groups wanted the game to demand more from them psychologically which caused a discussion regarding the target age of 10-14 being too wide and possibly should be changed to 10-12 for this project, with the possibility of a different project being developed for the ages of 13/14-17. We discussed that having different functional artifacts for "pre-teens" and "teenagers" was possibly the best idea since there is a cognitive developing growth in teenagers.

This project is in process of becoming a final usable game product since an Illustrator and a Designer are being hired to produce the final materials that will substitute the lent materials used for timely Low-Fidelity game development. The testers' results/comments will be used to better decide and ask from the Illustrator and the Designer specific materials that will turn the project into a better game.

This is a field that is extremely important and often overlooked in favor of a younger demographic. As stated previously, there is a very large willingness by the target audience to learn this information but unfortunately there are very few projects designed specifically for them. This project fills this void, providing a game developed on purpose and with the very important input from the psychology experts that guided the appropriateness of the content.

References

[1] Brocke, Jan vom & Hevner, Alan & Maedche, Alexander. 2020. "Introduction to Design Science Research." DOI:10.1007/978-3-030-46781-4_1. https://www.researchgate.net/publication/345430098_Introduction_to_Design_Science_Research

[2] Asadzadeh A, Shahrokhi H, Shalchi B, Khamnian Z, Rezaei-Hachesu P (2022). "Digital games and virtual reality applications in child abuse: A scoping review and conceptual framework." PLoS ONE 17(11): e0276985. https://doi.org/10.1371/journal.pone.0276985

[3] Joyce J. Endendijk , Henny K. Tichelaar, Menno Deen and Maja Deković. "Vil Du?! incorporation of a serious game in therapy for sexually abused children and adolescents." Child Adolesc Psychiatry Ment Health (2021) 15:25 https://doi.org/10.1186/s13034-021-00377-3

[4] Endendijk J, Tichelaar H, Deen M, Deković M. "A Therapeutic Game for Sexually Abused Children and Adolescents (Vil Du?!): Exploratory Mixed Methods Evaluation" JMIR Serious Games 2021;9(3):e26062 URL: https://games.jmir.org/2021/3/e26062 DOI: 10.2196/26062

[5] Erica Bowen, Kate Walker, Matthew Mawer, Emma Holdsworth, Emma Sorbring, Bo Helsing, Annette Bolin, Eline Leen, Paul Held, Valère Awouters, and Sebastiaan Jans. ""It's like you're actually playing as yourself": Development and preliminary evaluation of 'Green Acres High', a serious game-based primary intervention to combat adolescent dating violence." Doi: http://dx.doi.org/10.5093/in2014a5

[6] Sylvester Arnab, Katherine Brown, Samantha Clarke, Ian Dunwell, Theodore Lim, Neil Suttie, Sandy Louchart, Maurice Hendrix, Sara de Freitas. "The development approach of a pedagogically-driven serious game to support Relationship and Sex Education (RSE) within a classroom setting." DOI: http://dx.doi.org/10.1016/j.compedu.2013.06.013

[7] Melissa A. Bright, Diana Ortega, David Finkelhor, Kerryann Walsh. "Moving school-based CSA prevention education online: Advantages and challenges of the "new normal"." DOI: https://doi.org/10.1016/j.chiabu.2022.105807

[8] L.M. van der Lubbe, C. Gerritsen, M.C.A. Klein, K.V. Hindriks. "Empowering vulnerable target groups with serious games and gamification." DOI: https://doi.org/10.1016/j.entcom.2020.100402

[9] Cynthia Putnam, Melisa Puthenmadom, Marjorie Ann Cuerdo, Wanshu Wang, and Nathaniel Paul. 2020. Adaptation of the System Usability Scale for User Testing with Children. In Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems (CHI EA '20). Association for Computing Machinery, New York, NY, USA, 1–7. https://doi.org/10.1145/3334480.3382840

[10] Sauro, J. (2011). *User Experience: The Magazine of the User Experience Professionals Association.* SUStisfied? Little-known System Usability Scale facts.